Vol. IV, No. 2 SEPTEMBER, 1945

THE TOOL ENGINEER

OFFICIAL PUBLICATION OF THE ASTE AMERICAN SOCIETY OF TOOL ENGINEERS

John Doe, T. E. . . . . . *by C. V. Briner*

Crush Dressing of Grinding Wheels For Form Grinding—A Symposium

Introduction . . . . . *by Andrew E. Rylander*
1. Surface Grinding of Precision Contours . . . . . *by J. C. Wilson*
2. Selection of Grinding Wheels . . . . . *by Leslie B. Bellamy*
3. The Tools for Crush Dressing . . . . . *by L. A. Kitchen*
4. The Economics of Crush Dressing . . . . . *by Wm. Moreland*
5. Engineered Crush Dressers . . . . . *by Gunnar Skog*

Abrasives and Their Uses in Industry . . . . . *by O. McIntyre*

Gages and Inspection Systems—An Exposition . . . . . *by Anders Jansson*

Formula For Design of Cam Clamps . . . . . *by A. R. Goatley*

From Tool Making To Simplified Broaching . . . . . *by Rex Heath*

Departments

Fundamentals of Tool Engineering • The Insulation of Wire • A.S.T.E. News • Tools of Today • Andygrams • Gadgets • North, East, West, South in Industry • Good Reading • Index to Advertisers

Behind every product that is mass produced is the tool engineer

Up from the Drawing Boards

The P&W Keller is proving invaluable in turning out parts and pilot models for new equipment.

Bigger, more powerful airplanes, new inventions, changes in design, advanced models . . . all of these are flowing daily from America's drawing boards into experimental models and actual production lines.

Bridging the gap in thousands of instances is the Pratt & Whitney Keller machine . . . the "machine with a brain" which transforms wood or plaster models into finished steel experimental parts with speed, economy, and accuracy.

The Keller can make up any shaped part within a range of 2.5′ x 6′ x 12′ out of a plain slab of steel or Duralumin or similar metals. It can work in two or three dimensions. It side-steps costly tooling, expensive dies.

Built with the precision for which Pratt & Whitney is famous, the Keller has an inherent long life and dependability. As in war it will be equally at home turning out the products of peace . . . no conversion one way or the other. Full particulars on the scope and versatility of the Keller will be mailed upon request.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT

PUBLISHED MONTHLY BY

THE TOOL ENGINEER

AMERICAN SOCIETY OF TOOL ENGINEERS

VOLUME XV AUGUST, 1945 NUMBER 2

Editorial

Robert B. Powers . . . . *Executive Editor*
A. E. Rylander . . . . . *Technical Editor*
Doris B. Pratt . . . *A.S.T.E. News Section*
Charles R. McKinley
Technical Production Mgr.
James H. Donahue . *Technical Art Director*

Advertising

Clarence T. Etter . . . . *Advertising Mgr.*

Editorial Committee

G. J. Hawkey . . . . . *Chairman*
Ray H. Morris A. L. Potter
A. M. Schmit

Officers

C. V. Briner . . . . . *President*
A. M. Sargent . . . . . *First Vice-President*
W. B. Peirce . . . . *Second Vice-President*
T. P. Orchard . . . . *Third Vice-President*
A. M. Schmit . . . . . *Secretary*
W. J. Frederick . . . . . *Treasurer*
W. A. Dawson . *Assistant Secretary-Treasurer*
A. L. Potter . . . . . *Executive Secretary*

Board of Directors

C. V. Briner, *Chairman*

Edward J. Berry — John A. Lapham
D. D. Burnside — Frank Martindell
Frank W. Curtis — H. D. Mozeen
W. A. Dawson — Thomas P. Orchard
Arthur J. Dennis — W. B. Peirce
Robert B. Douglas — L. J. Radermacher
W. C. Fields — A. M. Sargent
W. J. Frederick — A. M. Schmit
William J. Gamble — Ernest M. Seifert
H. E. Goodfellow — Hayden R. Shearer
Carl A. Holmer — Howard Volz
Kenneth C. Jasper — William W. Young
Hallet D. Jones

TABLE OF CONTENTS

PAGE

JOHN DOE, T.E. . . . . *By C. V. Briner* 17

CRUSH DRESSING OF GRINDING WHEELS FOR FORM TOOL GRINDING—A SYMPOSIUM 18

INTRODUCTION . . . . . *by Andrew E. Rylander*
1. SURFACE GRINDING OF PRECISION CONTOURS . . *by J. C. Wilson*
2. SELECTION OF GRINDING WHEELS . . . *by Leslie B. Bellamy*
3. THE TOOLS FOR CRUSH DRESSING . . . . . *by L. A. Kitchen*
4. THE ECONOMICS OF CRUSH DRESSING . . . *by Wm. Moreland*
5. ENGINEERED CRUSH DRESSERS . . . . . *by Gunnar Skog*

ABRASIVES AND THEIR USES IN INDUSTRY . *by O. McIntyre* 29

GAGES AND INSPECTION SYSTEMS—AN EXPOSITION . . . . . *by Anders Jansson* 36

FORMULA FOR DESIGN OF CAM CLAMPS . . *by A. R. Goatley* 45

FROM TOOL MAKING TO SIMPLIFIED BROACHING . . . . . *by Rex Heath* 46

DEPARTMENTS

FUNDAMENTALS OF TOOL ENGINEERING
THE INSULATION OF WIRE 34

A.S.T.E. NEWS 49

TOOLS OF TODAY 65

ANDYGRAMS 69

GADGETS 70

NORTH, EAST, WEST, SOUTH IN INDUSTRY 71

GOOD READING 72

INDEX TO ADVERTISERS 134

American Society of Tool Engineers

National Headquarters

1666 Penobscot Bldg. Detroit 26, Michigan

The TOOL ENGINEER
Editorial and Advertising Offices:
550 W. Lafayette Blvd. Detroit 26, Michigan

The Tool Engineer is published monthly at 1666 Penobscot Building, Detroit 26, Michigan, in the interest of the members of the American Society of Tool Engineers. Advertising and Editorial departments are located at 550 W. Lafayette Blvd., Detroit 26, Michigan. Subscription is $2.00 per year. Non-members $6.00 per year. Copyright 1945 by the American Society of Tool Engineers. Entered as second-class matter February 8, 1945, at the post office at Detroit, Michigan, under the Act of March, 1879.

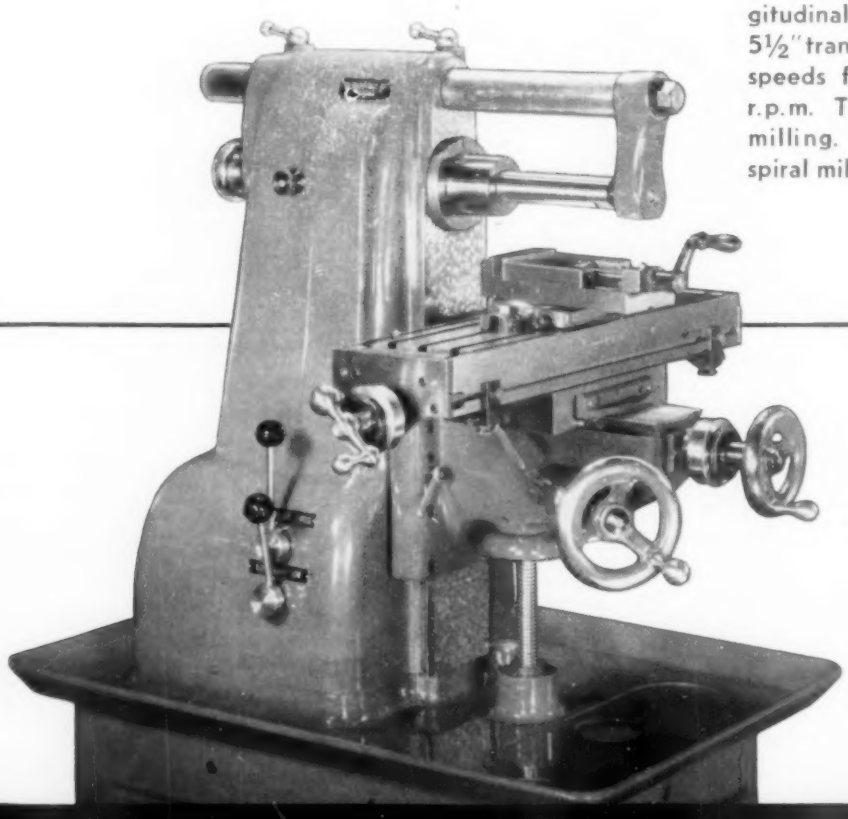
HARDINGE
ELMIRA, N.Y.

HARDINGE High Speed Precision Milling Machines meet the needs of your tool room and laboratory

Precision tool room milling is profitable on this milling machine, designed to meet a definite need in the tool room and laboratory The precision construction, along modern lines, combines ruggedness with extreme accuracy for ease of operation. Investment and time cost will indicate that larger milling machines are extremely expensive and awkward for many tool room and laboratory milling operations.

SPECIFICATIONS

1" collet capacity, 14" longitudinal, 13¼" vertical, 5½" tranverse travel, eight speeds from 110 to 1850 r.p.m. TM model for plain milling. UM model for spiral milling.

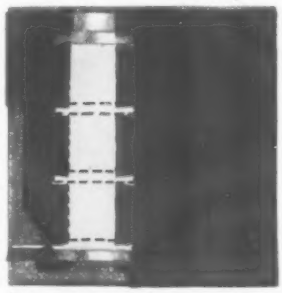


"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

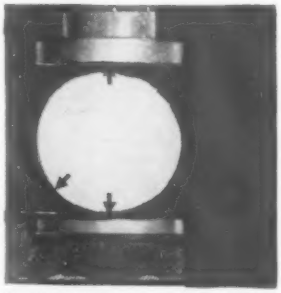
Why Not SEE

Rather than feel

Weight of Gage and operator's hand rests upon the fixed contact. Gage is only ⅝" wide.



The upper or reference contact is adjustable to any dimension within one inch.



Backstop locates work in center of contacts and is adjustable for size.

A *light* thumb pressure retracts the sensitive contact. Work surface is not marred. The contact movement is transferred *direct* to Indicator.

FEDERAL

INDICATOR SNAP GAGE

with-Retractable Anvil

Adjustable for Size

No Lost Motion

This Model 1330 P-100 Visual Dial Indicator Snap Gage marks a decided step ahead in gaging practice. Conventional type, fixed or solid snap gages depend upon "feeling", and personal variations in the sense of touch influence the inspection accuracy. But, you **see** with this.

The Model 1330 P-100 has other advantages too — **The retractable anvil** makes it easier to apply, and it eliminates all excuses for marring the surface of highly finished workpieces. **It is easily adjusted** to any dimension within one inch and locked in place. **There is no lost motion.** The movement of the sensitive contact is transferred directly without error to the Dial Indicator. **The weight of the Gage and the inspector's hand rests upon the fixed or reference contact. It is thin:** only ⅝". It is small; not over 6" at the longest point. It is light; weighs only 15 ozs. It reads in tenths (.0001"). Contacts are hard wearing Norbide (Made by Norton Co.) For more details concerning this modern snap gage write

FEDERAL PRODUCTS CORPORATION

1144 EDDY STREET **PROVIDENCE 1, R. I.**

★ ★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★ ★

Directory of A.S.T.E. Chapter Officers

AKRON CHAPTER, NO 47
Melvin P. Erdmann, *Chairman*
174 Portage Drive, Akron 3, Ohio
Alexander H. Ekesy, *Secretary*

ATLANTA CHAPTER, NO. 61
Sydney W. Barnett, *Chairman*
7 11th St. N.E., Atlanta, Ga.
George W. Brown, *Secretary*

BALTIMORE CHAPTER, NO. 13
C. Irwin Hochhaus, *Chairman*
3036 Oak Forest Dr., Parkville 14, Md.
Thomas F. Burke, *Secretary*

BINGHAMTON CHAPTER, NO. 35
Albert J. Pangburn, *Chairman*
556 Hooper Rd., Johnson City, R.D. No. 2, N.Y.
Roland B. Andrews, *Secretary*

BOSTON CHAPTER, NO. 33
Arthur A. Nichols, *Chairman*
% W. H. Nichols & Sons
48 Woerd Ave., Waltham 54, Mass.
Francis H. Leonard, *Secretary*

BUFFALO-NIAGARA FRONTIER CHAPTER, NO. 10
Julius J. Bemb, *Chairman*
164 Durham Ave., Buffalo 15, N.Y.
Arthur S. Twombly, *Secretary*

CEDAR RAPIDS CHAPTER NO. 71
John M. Speck, *Chairman*
1921 8th Ave., S.E., Cedar Rapids, Iowa
John L. Stark, *Secretary*

CENTRAL PENNSYLVANIA CHAPTER, NO. 22
Preston A. Rickrode, *Chairman*
R. D. No. 1, Abbottstown, Pa.
Carey E. Noel, *Secretary*

CHICAGO CHAPTER, NO. 5
Frank A. Armstrong, *Chairman*
Pratt & Whitney Div., Niles-Bement-Pond Co., 565 W. Washington Blvd., Chicago 6, Illinois
Lawrence J. Kollath, *Secretary*

CINCINNATI CHAPTER, NO. 21
C. W. Stricker, *Chairman*
% Auto Sun Prod. Co.
529 Poplar St., Cincinnati 14, Ohio
Joseph Aprile, *Secretary*

CLEVELAND CHAPTER, NO. 3
Joseph I. Karash, *Chairman*
% Reliance Elec. & Eng'g Co.
1088 Ivanhoe Rd., Cleveland 10, O.
Warren H. Fitzsimmons, *Secretary*

COLUMBUS CHAPTER, NO. 36
Howard F. Volz, *Chairman*
3019 Palmetto Ave., Columbus 4, O.
Charles W. Warner, *Secretary*

DAYTON CHAPTER, NO. 18
George C. Tillotson, *Chairman*
108 South 3rd, Tipp City, Ohio
J. Robert Kuntz, *Secretary*

DECATUR CHAPTER, NO. 58
Harry J. Moffatt, *Chairman*
965 N. University, Decatur, Ill.
Victor R. Parlow, *Secretary*

DETROIT CHAPTER, NO. 1
E. Wayne Kay, *Chairman*
14127 Winthrop Ave., Detroit 27, Michigan
Guy L. Carpenter, *Secretary*

ELMIRA CHAPTER, NO. 24
George N. Morcean, *Chairman*
504 Hart St., Elmira, N.Y.
Floyd B. Allen, *Secretary*

ERIE CHAPTER, NO. 62
William J. Koch, *Chairman*
3820 Trask Ave., Erie, Pa.
Carl A. Eigabroadt, *Secretary*

FAIRFIELD COUNTY CHAPTER, NO. 6
Carl B. Christensen, *Chairman*
297 Putaam St., Bridgeport, Conn.
J. R. Dalley, *Secretary*

FLINT CHAPTER, NO. 68
Michael Skunda, *Chairman*
1813 Stevenson St., Flint 4, Mich.
Harlan T. Pierpont, *Secretary*

FOND DU LAC CHAPTER, NO. 45
Gideon Kane, *Chairman*
916 Allouez Terrace, P.O. Box 581, Green Bay, Wis.
E. J. Kaiser, *Secretary*

FORT WAYNE CHAPTER, NO. 56
Milton H. Kline, *Chairman*
4315 S. Fairfield Ave., Fort Wayne 6, Ind.
Edward K. Burt, *Secretary*

FOX RIVER VALLEY, NO. 72
Thomas L. Kings, *Chairman*
427 Weston Ave., Aurora, Ill.
Roy G. Frogness, *Secretary*

GOLDEN GATE CHAPTER, NO. 28
Louis A. Talamini, *Chairman*
2518 64th Ave., Oakland, Calif.
Ernest C. Holden, *Secretary*

GREATER NEW YORK CHAPTER, NO. 34
Jacob D. Schiller, *Chairman*
1440 East 14th St., Brooklyn, N.Y.
Adelbert H. Tuttle, Jr., *Secretary*

HAMILTON CHAPTER, NO. 42
Harry H. Whitehall, *Chairman*
P.O. Box 200, Hespeler, Ont.
John E. Ball, *Secretary*

HARTFORD CHAPTER, NO. 7
George A. Highberg, *Chairman*
14 Hickory Lane, West Hartford 7, Conn.
Melville L. Merrill, *Secretary*

HOUSTON CHAPTER, NO. 29
H. R. Turner, *Chairman*
1418 Elliott, Houston 3, Texas
L. P. Robinson, *Secretary*

INDIANAPOLIS CHAPTER, NO. 37
Harry L. Boese, *Chairman*
2619 E. 11th St., Indianapolis 1, Indiana
David R. Smith, *Secretary*

KANSAS CITY CHAPTER, NO. 57
H. Robert Brown, *Chairman*
828 W. 72nd St., Kansas City, Mo.
Joseph W. Gallagher, *Secretary*

LAKEHEAD CHAPTER, NO. 59
Stuart Scorer, *Chairman*
217 S. Marks St., Ft. William, Ont., Can.
Dick Cross, *Secretary*

LITTLE RHODY CHAPTER, NO. 53
Joseph F. McGowan, *Chairman*
486 Pawtucket Ave., Pawtucket, R.I.
John H. Williams, *Secretary*

LOS ANGELES CHAPTER, NO. 27
Arthur D. Lewis, *Chairman*
2500 Lorraine Rd., San Marino 9, Calif.
R. Gerald Stronks, *Secretary*

LOUISVILLE CHAPTER, NO. 54
John Thomas, *Chairman*
Box 1860, Louisville, Ky.
Ancil Brown, *Secretary*

MILWAUKEE CHAPTER, NO. 4
A. R. Gieringer, *Chairman*
3419 N. 55th St., Milwaukee 10, Wis.
Richard Ford, *Secretary*

MONTREAL CHAPTER, NO. 50
Gerald A. Rogers, *Chairman*
5894 Coolbrook Avenue, Montreal, Quebec, Can.
Molson M. Hannaford, *Secretary*

MUNCIE CHAPTER, NO. 70
John D. Rovick, *Chairman*
% Michigan Tool Co., Box 1257
Muncie, Ind.
James C. Rutter, Jr., *Secretary*

NASHVILLE CHAPTER, NO. 43
Otis W. Dresslar, *Chairman*
% Dresslar-White Co.
201 Woodland St., Nashville 6, Tenn.
Guy Hamilton, *Secretary*

NEW HAVEN CHAPTER, NO. 41
Jack F. Sargent, *Chairman*
131 Church St., Wallingford, Conn.
Alton V. Pollard, *Secretary*

NEW ORLEANS CHAPTER, NO. 60
Edwin E. Graf, *Chairman*
3257 Belfort Ave., New Orleans 19, La.
A. W. Bernhart, *Secretary*

NIAGARA DISTRICT CHAPTER, NO. 65
Henry Hendriks, *Chairman*
126 Merritt St., St. Catharines, Ont., Can.
G. Frederick Bush, *Secretary*

NORTH TEXAS CHAPTER, NO. 51
F. D. Browne, *Chairman*
6411 Lake Circle Dr., Dallas 14, Texas
John A. Lapham, *Secretary*

NORTHERN NEW JERSEY CHAPTER NO. 14
Frank L. Delhagen, *Chairman*
17 Temple Pl., Irvington, N.J.
H. Wilson Ryno, *Secretary*

PEORIA CHAPTER, NO. 31
E. M. Bertschi, *Chairman*
Eureka Knolls, Eureka, Ill.
C. B. Hartsock, *Secretary*

PHILADELPHIA CHAPTER, NO. 15
John W. Noble, *Chairman*
160 Cedarcroft Ave., Audubon, N.J.
William W. Cady, *Secretary*

PHOENIX CHAPTER, NO. 67
Charles W. Clarke, *Chairman*
2214 N. Central Ave., Phoenix, Arizona
Jack R. Robinson, *Secretary*

PITTSBURGH CHAPTER, NO. 8
C. E. J. Brickner, *Chairman*
Westinghouse Electric Corp.
Room 5-G-47, East Pittsburgh, Pa.
W. S. Risser, *Secretary*

PONTIAC CHAPTER, NO 69
C. F. Stapies, *Chairman*
1366 Yosemite, Birmingham, Mich.
George F. Bryan, *Secretary*

PORTLAND (MAINE) CHAPTER NO. 46
John M. Johnston, *Chairman*
38 Urquhart St., Rumford, Me.
Charles E. Paige, *Secretary*

PORTLAND (OREGON) CHAPTER, NO. 63
Raymond E. Neils, *Chairman*
Schmitt Steel Co.
2407 N.W. 28th, Portland 10, Ore.
John R. Barrett, *Secretary*

POTOMAC CHAPTER, NO. 48
Lawrence Didszoneit, *Chairman*
511 Woodland Terrace, Jefferson Pk., Alexandria, Va.
Daniel T. Hilleary, *Secretary*

RACINE CHAPTER, NO. 2
Raymond M. Goodsell, *Chairman*
3504 Washington Ave., Racine, Wis.
George J. Klimt, *Secretary*

RICHMOND CHAPTER, NO. 66
Roland E. Lockridge, *Chairman*
250 S.W. 1st St., Richmond, Ind.
Floyd T. Sykes, *Secretary*

ROCHESTER CHAPTER, NO. 16
Earle W. DeBisschop, *Chairman*
241 Plymouth Ave. S., Rochester 8, N.Y.
Donald F. Kohler, *Secretary*

ROCKFORD CHAPTER, NO. 12
Walter R. Lustig, *Chairman*
519 Pearl St., Rockford, Ill.
Ernst A. Norrman, *Secretary*

ST. LOUIS CHAPTER, NO. 17
Willis G. Ehrhardt, *Chairman*
% Ehrhardt Tool & Mach. Co.
914 Monroe St., St. Louis, Mo.
Robert W. Boehlow, *Secretary*

SAN DIEGO CHAPTER, NO. 44
W. F. Asmus, *Chairman*
2905 Bancroft St., San Diego 4, Calif.
Jerome J. Groff, *Secretary*

SCHENECTADY CHAPTER, NO. 20
E. H. Girardot, *Chairman*
% Gen. Elec. Co., Bldg. 48-2
Schenectady 5, N.Y.
N. Y. Coxe, *Secretary*

SEATTLE CHAPTER, NO. 39
A. G. Means, Jr., *Chairman*
96 S. E. Place, Mercer Island, Seattle, Wash.
Kenneth Bergerson, *Secretary*

SOUTH BEND CHAPTER, NO. 30
P. W. Winkelmann, *Chairman*
1260 Woodward Ave., South Bend 16, Ind.
James L. Kemp. *Secretary*

SPRINGFIELD (ILLINOIS) CHAPTER, NO. 64
John V. Javorsky, *Chairman*
1401 Lowell Ave., Springfield, Ill.
Francis James, *Secretary*

SPRINGFIELD (MASS.) CHAPTER, NO. 32
Edward J. Stone, *Chairman*
Westinghouse Electric Corp.
653 Page Blvd., E. Springfield, Mass.
Owen C. Stevens, *Secretary*

SYRACUSE CHAPTER, NO. 19
Emiel J. Floring, *Chairman*
208 Briarcliff Rd., R.D. No. 3, East Syracuse, N.Y.
Lester H. Collins, *Secretary*

TOLEDO CHAPTER, NO. 9
Samuel W. Burgess, *Chairman*
915 Keil Road, Toledo 7, Ohio
Roy J. Dusseau, *Secretary*

TORONTO CHAPTER, NO. 26
R. Eric Crawford, *Chairman*
4 Norma Crescent, Toronto 9, Ont.
John B. Burk, *Secretary*

TRI CITIES CHAPTER, NO. 23
A. L. Geiger, *Chairman*
806 E. 13th St., Davenport, Iowa
Lennart N. Dahlen, *Secretary*

TWIN CITIES CHAPTER, NO. 11
Wallace A. Ahlberg, *Chairman*
1041 Jessie St., St. Paul, Minn.
Walter H. Erskine, *Secretary*

TWIN STATES CHAPTER, NO. 40
George R. Morin, *Chairman*
31 Woolson Ave., Springfield, Vt.
William C. Hadfield, *Secretary*

WESTERN MICHIGAN CHAPTER, NO. 38
Thomas E. Newby, *Chairman*
715 Fuller Ave. S.E., Grand Rapids 6, Mich.
H. W. Young, *Secretary*

WICHITA CHAPTER, NO. 52
Harry Giwosky, *Chairman*
547 South Crestway, Wichita 9, Kansas
Leslie R. Glassburner, *Secretary*

WILLIAMSPORT CHAPTER, NO. 49
J. Harold Shafer, *Chairman*
R.D. No. 1, Cogan Station, Penna.
Stanley Barendt, *Secretary*

WINDSOR CHAPTER, NO. 55
Cecil G. Sampson, *Chairman*
2372 Windermere, Windsor, Ont.
P. O. Harrison, *Secretary*

WORCESTER CHAPTER, NO. 25
F. William McQueston, *Chairman*
Union St., Barre, Mass.
Carl D. Schofield, *Secretary*

STANDARD

Announcing

DuBo

The Better **PLUG GAGE**

FIXED LIMIT TYPE

PATENTS PENDING

Newest Development in Simple, Precise, Effortless BORE GAGING

Again STANDARD pioneers in producing DuBo, newest, most completely satisfactory bore checking gage of the fixed limit type yet produced. DuBo brings to bore gaging new, effortless, finger-tip control, assured precision and speed far beyond the scope of ordinary plug gages . . . whether used by skilled or unskilled workers. Vivid color bands unmistakably identify "go" and "not go" members; unusual lightness and balance minimize fatigue and fatigue-errors; simple manipulation makes DuBo ideal for use at bench or machine.

Simple, yet Precise... Light, yet Sturdy

EASY TO USE... TELLS MORE

Spherical shape, ingenious chamfering and relief, make entrance easy, gaging positive.

★

May be entered into bores actually smaller than gage diameter without forcing or marring work piece.

★

"Go" and "not go" color signals prevent confusion, fumbling, wasted motions, faulty readings.

★

Chamfer edge helps clean bore and prepares clean surface for accurate gaging.

★

Finger-tip "feel" and control reveal true internal conditions at any point in bore.

★

Reveals out - of - roundness, taper, belling and dimensional deviations by unmistakable tilt of handle.

★

May be used in deep bores and close to bottom of blind bores.

Write! Send NOW for illustrated DuBo bulletin . . . tells all about this remarkable new gage.

STANDARD GAGE CO., Inc.

Poughkeepsie, N.Y.

METAL-WORKING AIDS FOR
POSTWAR
TOOL DESIGNING • PRODUCT DESIGNING
PRODUCTION PLANNING • CONSULTING
INDUSTRIAL ENGINEERING • OPERATION
SHEET WRITING • AUTOMATIC AND
SPECIAL MACHINE DESIGN • GRAPHIC
ILLUSTRATING • TECHNICAL LITERATURE
We've been in the thick of the fighting on the industrial front, and will remain in it during the Reconversion period . . . planning, designing, directing for successful and profitable production changeovers. The advancements realized in our specialties (above) will help us immeasurably to help you immeasurably. Our enriched backlog of experience assures success to the solving of your production problems, and to the completion of your postwar tooling plans. Your inquiries are invited.
AMERICAN Tool Engineering Company
GENERAL MOTORS BUILDING • 1775 BROADWAY • NEW YORK 19, N. Y.

another Baker installation FOR INCREASED PRODUCTION of airplane engine crankcases

Handling four operations on one set-up, this Baker vertical multiple spindle drilling and counterboring machine speeds up production on upper crankcase halves for 12-cylinder aircraft engines.

Operations consist of drilling 14 holes, .694" dia., and then counterboring them to .6975" dia., in each of two banks or faces of the crankcase.

Fixture is mounted on a hydraulically operated in-and-out slide which moves fixture and work to front for loading and unloading, to first station under 14 drilling spindles, then to rear station under 14 counterboring spindles. Fixture is pivot mounted for indexing work at proper angle to handle operations on both banks or faces.

With only one set-up required for four operations, production is increased and floor-to-floor time considerably reduced.

Maximum production capacity, long life and lasting precision are assured by these features:

1. Twin pull cylinder construction, applying feeding and rapid traverse pressures from both sides of multiple head saddle carrier, with feed pressure taken to solid base and to foundation.

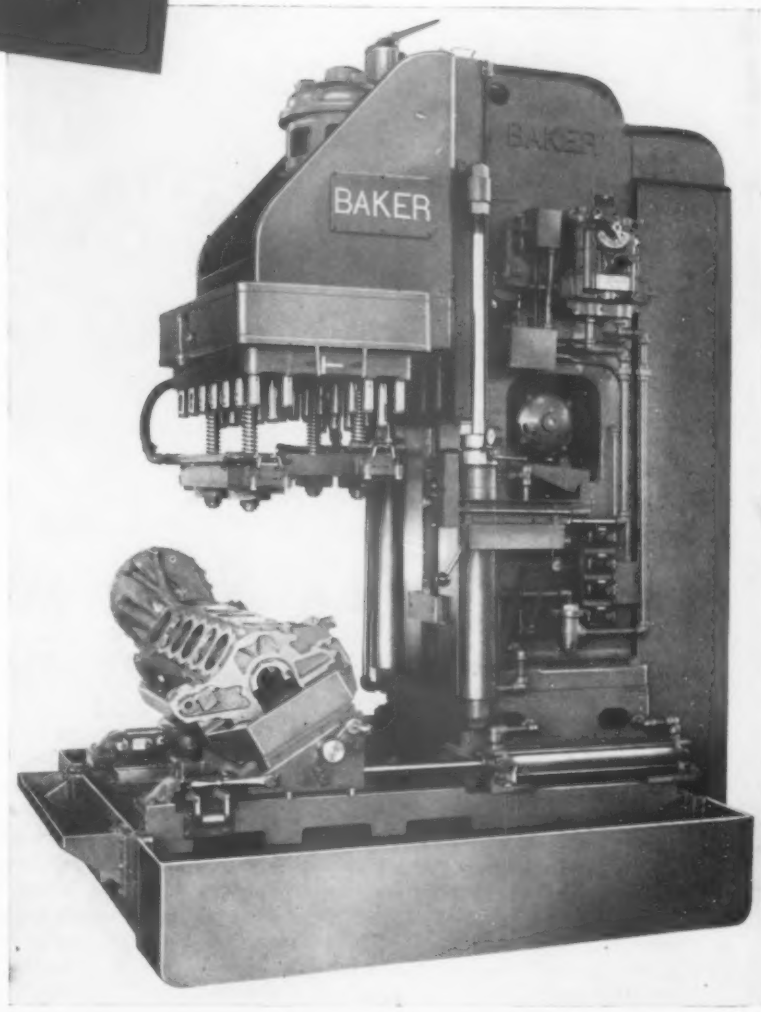
2. Simplified direct-coupled motor drive to 28-spindle head, with motor-mounted directly above head in ample size heavy saddle head bracket.

3. Lubricating pump in multiple head provides ample lubrication of all gears and bearings; sight glass at front shows at all times whether head is being properly lubricated.

4. All cutting tools are supported in bushings directly above the cut; bushings are mounted in a support plate carried from head of machine to locating plug arrangement which locates bushing plate directly from crankcase bores.

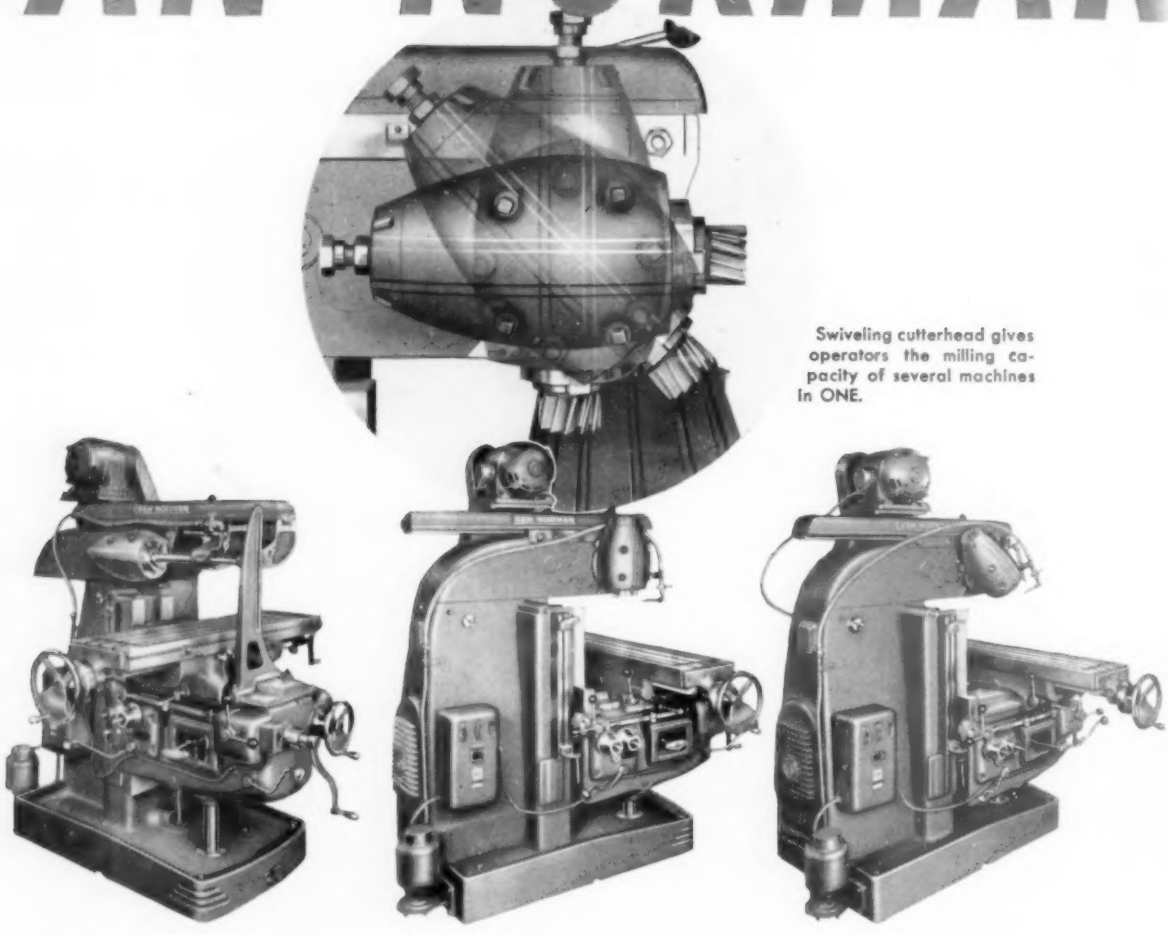
5. Flat ways are precision ground, as on all Baker vertical hydraulic feed machines. Baker recently installed one of the largest size Thompson grinders for this precision work.

● Baker production engineers will be glad to work with you in solving your drilling, tapping, reaming or counterboring problems. Phone, wire or write for this consultation service—no obligation.



CONTACT *Baker Bros. Inc.* ARMY NAVY Toledo 10, Ohio

VAN NORMAN



Swiveling cutterhead gives operators the milling capacity of several machines in ONE.

HORIZONTAL MILLING | VERTICAL MILLING | ANGULAR MILLING

RAM-TYPE MILLERS

Meet Every Milling Requirement . . . Horizontal, Vertical, Angular

The versatility of Van Norman Ram-Type Millers enables you to plan your work so that idle machine time can be practically eliminated—operators and machines can be kept busy daily.

For instance, you have several Van Norman Ram-Type Millers. Each of these machines gives you the working capacity of a horizontal, angular and vertical miller. No matter what type of work you have from day to day, each Van Norman Ram-Type Miller can do the job. The result is no waiting for specific machines . . . no production delays . . . increased profits from full utilization of the operators and millers. And another important advantage is that Van Norman Millers will meet post-war requirements for tool room and general purpose milling.

The adjustable cutterhead saves money and insures accurate work because most jobs can be carried through to completion without changing the work set-up. Add to this such features as movable ram, front and rear directional control of all power feeds, front and rear control of manual feeds, heavy-duty column, knee and saddle assemblies, heavy-duty ram-type arbor support, conveniently located speed selector, and you'll readily see how Van Norman Ram-Type Millers insure accuracy, save money, speed milling operations and reduce rejects. They are available with plain or swiveling table. Write for complete information today.

"It pays to Van Normanize"

VAN NORMAN COMPANY, SPRINGFIELD 7, MASS.

TANTUNG
Non-ferrous Cast Alloy Cutting Tools
– with high red hardness and strength for those difficult "in-between" jobs.
40 50 60 70 80 90
SURFACE
HIGH-SPEED STEEL RANGE
100 110 120 140 160 180
FEET PER
TANTUNG RANGE
200 250 300 350 400 450 500 600
MINUTE
VASCOLOY-RAMET CARBIDE RANGE

CHOOSE YOUR TOOLS

simply and scientifically

UP TO 90 SURFACE FEET PER MINUTE, High Speed Steel Tools are best, BUT at higher speeds they require frequent grinding, valuable time is Jost, production suffers.

BETWEEN 90 and 190 SURFACE FEET PER MINUTE, *TANTUNG IS IDEAL.* Tantung operates at higher speeds, will take heavier cuts and feeds. It produces more pieces per grind than high speed steel and will do it in substantially less time. Performance records consistently show six times tool life and trebled production. Tantung cuts any material that can be machined. Write for catalog of full line of Tantung Cast Alloy Cutting Tools.

FOR HIGHER SPEEDS, use Vascoloy-Ramet Tantalum/Tungsten Carbide Tools, by every comparison the world's finest carbide.

FREE SURFACE SPEED TABLE AND TOOL SELECTOR **CHARTS**

in Wall size and Pocket size. **THESE CHARTS** show at a glance — table of speeds, feeds and proper tool selection, whether you use high speed steel, TANTUNG, or cemented carbide.

The Vascoloy-Ramet standard of quality is reflected in lower overall machining costs when you use Tantung or Tantalum/Tungsten Carbide Tools.

4527

VASCOLOY RAMET CORPORATION

NORTH CHICAGO, ILLINOIS • DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES

STARRETT HACKSAWS

TRADE MARK

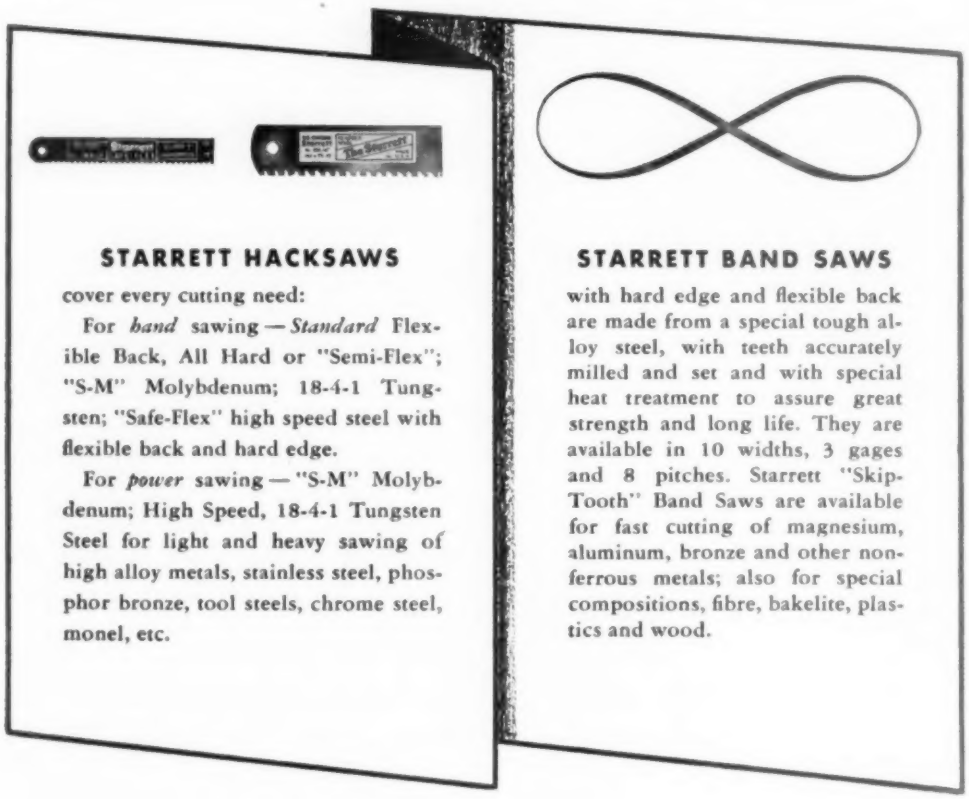
Starrett

REG U.S. PAT. OFF.

stands for

Good HACKSAWS and BAND SAWS as well as for fine Tools

Your Starrett Tool Distributor stocks and recommends Starrett Hacksaws and Metal Cutting Band Saws. Ask for them on your next order. Made to meet standards of quality and performance worthy of the "World's Greatest Toolmakers", you'll find that they *cut quicker, last longer.*



STARRETT HACKSAWS

cover every cutting need:

For *hand* sawing — *Standard* Flexible Back, All Hard or "Semi-Flex"; "S-M" Molybdenum; 18-4-1 Tungsten; "Safe-Flex" high speed steel with flexible back and hard edge.

For *power* sawing — "S-M" Molybdenum; High Speed, 18-4-1 Tungsten Steel for light and heavy sawing of high alloy metals, stainless steel, phosphor bronze, tool steels, chrome steel, monel, etc.

STARRETT BAND SAWS

with hard edge and flexible back are made from a special tough alloy steel, with teeth accurately milled and set and with special heat treatment to assure great strength and long life. They are available in 10 widths, 3 gages and 8 pitches. Starrett "Skip-Tooth" Band Saws are available for fast cutting of magnesium, aluminum, bronze and other non-ferrous metals; also for special compositions, fibre, bakelite, plastics and wood.

Ask your mill supply distributor to make *yours* STARRETT'S.

Now, with 3 Service Stars

THE L. S. STARRETT CO. • ATHOL • MASSACHUSETTS • U.S.A.

World's Greatest Toolmakers

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK

HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

Straightening operations on a faster schedule

Two 35 ton Hannifin hydraulic presses with 120 inch long tables are used at the Axelson Manufacturing Co. plant for straightening on a variety of work.

Precision straightening of a variety of work at the Los Angeles plant of Axelson Manufacturing Co., varying from long light wall tubing to heavy work, can be handled efficiently on these 35 ton presses because of the sensitive pressure control. This control of ram pressures delivers anything from a few pounds to full press capacity, in proportion to movement of the hand lever or foot pedal control. Because this control is so simple and natural, accurate work can be done rapidly and consistently, whether on large or small pieces.

Hannifin hydraulic presses are compact, self-contained units with built-in motor driven hydraulic power. Many standard types are available for straightening, press assembly, forming, testing, and similar work, in capacities from 5 tons to 150 tons. Hannifin press performance can help you meet today's production needs. Write for press bulletins.

HANNIFIN MANUFACTURING COMPANY

621-631 SOUTH KOLMAR AVENUE · CHICAGO 24, ILLINOIS

HANNIFIN

HYDRAULIC PRESSES

GRINDING 9000 PIECES PER HOUR ON THE HANCHETT 36 A

It's Automatic

Tough to handle steel castellated nuts feed from loader onto magnetic work table, pass under grinding wheel, slide down chute through demagnetizer — at the rate of 9000 per hour.

Hanchett No. 36A stands for high production and accurate finishing whenever grinding is discussed.

For further details see your nearest Hanchett dealer or write for Bulletin 145TI

With one pass under the horizontal grinding wheel, 150 steel castellated nuts (7/16" across flats) are precisely ground, on one side — EVERY MINUTE — then the opposite side is ground at the same rate. And what's more, a total of .015" stock is removed. That's really making a tough grinding job look easy.

On this particular Hanchett No. 36A Rotary Surface Grinding application, parts are semi-automatically loaded — discharged automatically from the magnetic work table and chuted through the demagnetizer.

Hanchett prides itself in turning the tough grinding jobs into high production ones, held to really close tolerances. Hanchett engineers will be glad to show you how a 36A or one of their other equally superb surface grinders can DOUBLE, TRIPLE, or QUADRUPLE your finished grinding production time.

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE — THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.

Crack Down on Down-Time!

CHANGE TO

TECO CEMENTED CARBIDE

AND GET

- More pieces between grinds
- More grinds per tool
- Less down time
- Lower tool cost

You can reduce your present down-time—and save production, costs and manpower—by tooling up with longer-wearing TECO Cemented Carbide.

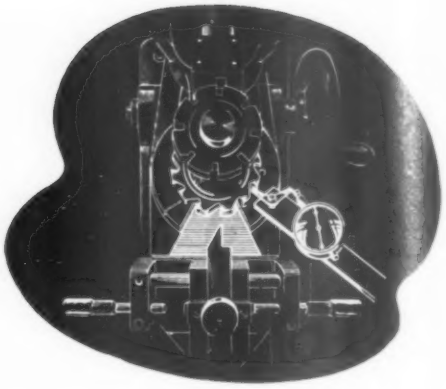
TECO Cemented Carbide produces more pieces between grinds because intense hardness gives it greater resistance to wear, while controlled toughness and uniformity make it more resistant to breakage. Result: Teco Cemented Carbide stays on the job longer—causes fewer machine stoppages due to dull tool edges or broken tips.

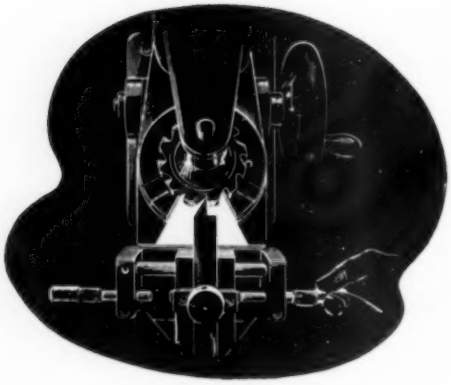
Check these properties of TECO Cemented Carbide against your present cutting tools . . . on your own lathes, under your own conditions. Send us details of your operation. Or have a tool engineer discuss your needs. Catalog and price list on request.

TUNGSTEN ELECTRIC CORPORATION
570 39th Street, UNION CITY, N. J.

TECO
CEMENTED CARBIDE
Pioneers in Tungsten Carbides for over a Quarter Century

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representatives: Indianapolis, Ind., Chicago, Ill., Detroit, Mich.





Want a simpler way TO CHECK YOUR CUTTERS?

With the DETROIT combined hook and spacing checker you can check both cutter hook and flute spacing, at a glance. Hook is checked optically, spacing by a *built-in* indicator.

No surface plates needed
No separate dial indicators
No separate height gages

As near foolproof as a precision checking device can be made. Remarkably easy and quick to operate. Checks both shell and shank type cutters.

For complete description, ask for Bulletin HC-43

BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT 11,
MICH., U.S.A

FOR THE FIRST TIME—

Authoritative information about Crush Form Grinding Precision Contours on a Completely Engineered Machine

Results of ten years of full-time study and development are graphically illustrated in this first pictorial booklet on crush form grinding precision contours with surface grinders. Savings in time and labor and improvement of finished work made possible by completely engineered machines warrant a thorough investigation of this machine process.

Send Coupon for Free Copy

CRUSH FORM CONTOUR GRINDING DEVELOPMENT LABORATORY

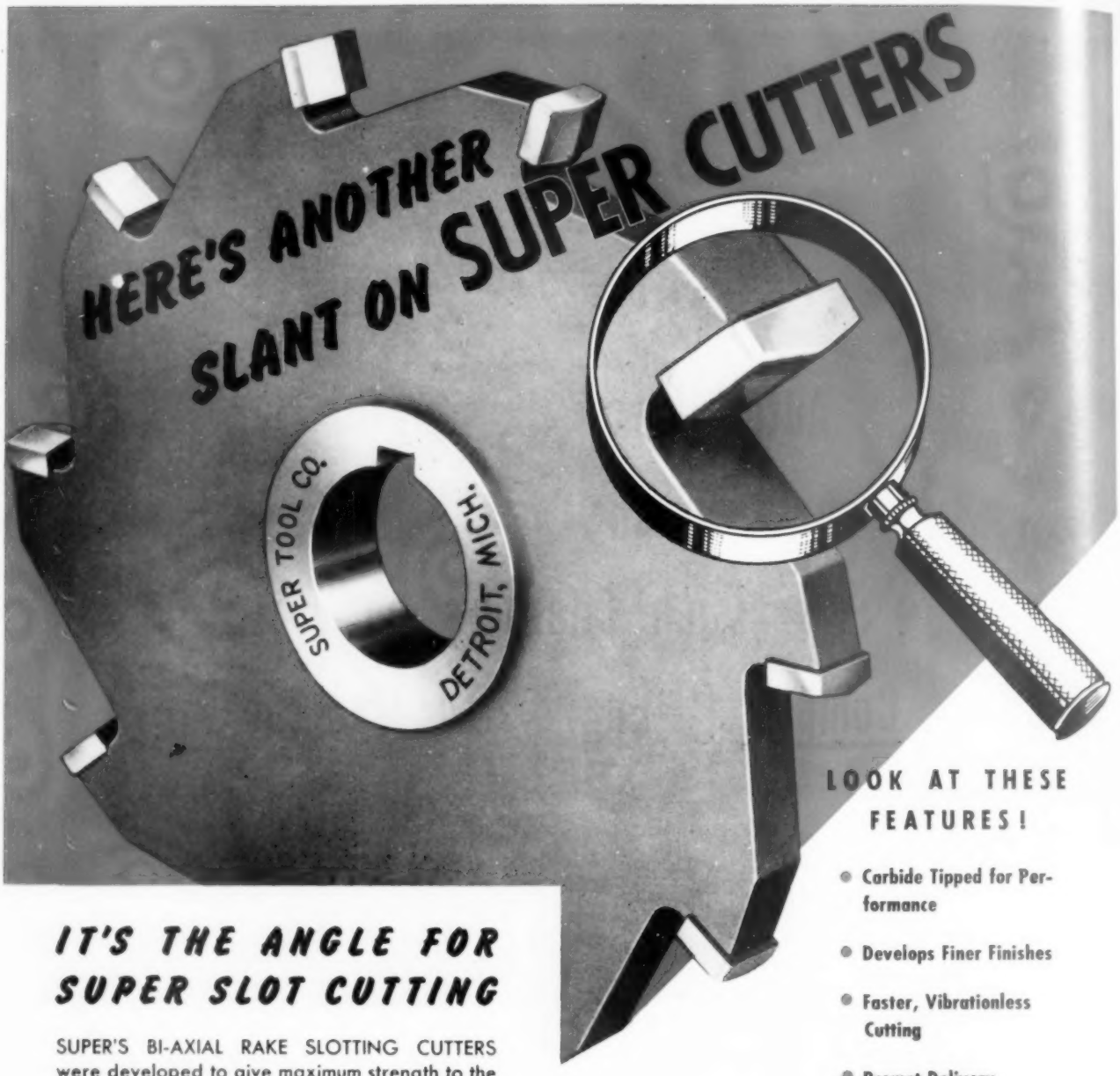
The Thompson Grinder Co. Inc., Dept. 16, Springfield, Ohio

Gentlemen: Please send me your new 16 page pictorial book describing Crush Form Contour Grinding on Surface Grinders.

*Name*_____ *Position*_____

*Company*_____ *Address*_____

*City*_____ *Zone*____ *State*_____



LOOK AT THESE FEATURES!

- Carbide Tipped for Performance
- Develops Finer Finishes
- Faster, Vibrationless Cutting
- Prompt Delivery

IT'S THE ANGLE FOR SUPER SLOT CUTTING

SUPER'S BI-AXIAL RAKE SLOTTING CUTTERS were developed to give maximum strength to the cutting edge which receives the initial impact at the start of each chip.

Another outstanding advantage of this SUPER CUTTER is that the cutting force of one-half of the tip balances the force of the other half, removing the chief cause of vibration in slotting operations.

Finer finishes and faster production result when you use SUPER'S BI-AXIAL RAKE CUTTERS in your slotting operations.

Available in a wide range of standard sizes and in special sizes on special orders.

WHATEVER YOUR CUTTING JOB LOOK FIRST TO SUPER

Carbide tipped tools for Turning, Facing, Reaming, Forming, Spot Facing, Boring, Grooving, Grinder Rests, Wear Parts, Counterboring, Shaving Centers, Special Purposes.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

John Doe, *T. E.*

LAST October, the Educational Committee of your Society submitted a preliminary report of a survey conducted among industrial executives. That survey showed that 84% "believed that the science of manufacturing has progressed to and reached a complexity and importance enough to warrant the recognition of Tool Engineering as a separate and DISTINCT BRANCH OF THE ENGINEERING PROFESSION." Further, 99% believed that educational facilities should be provided to shorten the time required to turn out a full-fledged Tool Engineer.

Surprising? Hardly—to us in Industry and in the ASTE. Not surprising even to the founders of the Society who foresaw the day when Tool Engineering would be recognized as one of the most important of the Engineering Professions.

Nevertheless, that survey was and remains a challenge to our Society. Representing, as it does, thousands of Tool Engineers who had to come up "the hard way" because there was no other way, the ASTE was being looked to by its membership to do something about it.

Well, the ASTE has been doing something about it for years and is continuing to do something about it. Until recently, however, progress had been aggravatingly and discouragingly slow, particularly to those who were leading the fight. The breaking down of age-old barriers in the field of Engineering Education takes time. It is a whittling process—not a grand attack.

But—the walls have begun to crack. Here and there, the Tool Engineering profession is beginning to achieve the recognition it deserves in the educational field. Rochester Institute of Technology is about to institute a regular Tool Engineering Course. At Dayton, a Tool Engineering Course is to be launched this fall. Ohio State is making a survey to determine its course of action. Reports from Atlanta state that Georgia Tech hopes to offer a Tool Engineering Course within the near future.

Hardly a revolution yet, but definite sign-posts for the future. Encouragement and a vindication of our faith. Encouragement to intensify the battle for recognition of OUR profession. Vindication of the years of unheralded and thankless work by officers, committees and individual members of the ASTE.

From here on, the work of a few will not suffice. It will take organized effort to achieve the final objective of general recognition of Tool Engineering as a full-fledged Profession, worthy of being taught in every major technical school of the land. Without the ASTE that objective would be impossible. Through the ASTE it can be reached and with it your Society will continue to grow in stature as will the value of every individual membership.

C. V. BRINER,
President, 1945–46

A Symposium:-

Crush Dressing of Grinding Wheels For

Completely engineered surface grinders and crush forming of wheels permit grinding of simple as well as involved contours.

Surface Grinding of Precision Contours

by C. J. Wilson

AS THE result of ten years of development with crush form grinding of simple shapes and complicated precision contours on surface grinders, methods of machining by this process have been constantly improved. Today, it is possible to tell, by studying a contour, whether or not it can be produced efficiently and how the surface grinder should be engineered for each particular type of crush form grinding. Some of the shapes produced by modern crush form contour grinders are shown on these pages. Each represents a problem in complete machine design to meet individual operating and production requirements.

Early Development

For many years, as you doubtless know, the grinding of irregular contours on precision parts has been a most difficult task. It was performed by a skilled craftsman capable of truing the correct shape into the grinding wheel or manipulating the work pieces on a sine bar chuck with special fixtures to form the correct shape.

About ten years ago, we were confronted with the task of making steel wool tools, which consisted of a flat piece of carbon steel with Vee serrations ground in on one side as fine as one hundred serrations to the inch. These tools were first produced by cutting the serrations in the soft steel and then they were heat treated. The result was that the fine teeth were burned off—in some cases decarburized by the heat treating operation so that the tools had short cutting life.

We then started experimenting with the possibility of using a hardened steel roller having the desired shape of the steel wool tool formed in the periphery. This hardened steel roller was used to transfer the shape into the grinding wheel. It was a well known fact that when the peripheral speed of

J. C. Wilson **has been active in the grinding field for many years, particularly in the manufacture of wheels and in the design and building of precision grinding machines. For the past four years, he has been Chief Engineer and Sales Manager of The Thompson Grinder Company.**

While the story of Crush Dressing of Grinding Wheels is adequately told by the several contributors to this Symposium, a prefactory note may tend to allay any possible confusion regarding the genesis of the method and its compartively recent adoption by American industry. In this connection, it may be pointed out that the several articles are independently presented, as a result of which there is bound to be some overlapping and repetition. However, the thoughts expressed are too pertinent to the subject to permit of any considerable deletion.

Revolutionary as it may seem at the moment, crusher dressing of grinding wheels is not essentially new. Its "newness" lies in application to modern precision grinding of threads and intricate forms. While the method presumably started in Europe (it was used to dress grindstones while America was still a colony) neither the Continent nor the States can truly claim originality for its ultimate refinement into a modern tool. For a tool it is!—a precision tool for the grinding of precision forms.

Previous to World War II, English manufacturers had used crush dressing to a considerable extent for dressing multi-ribbed wheels for thread grinding. In the meanwhile, various American manufacturers are said to have experimented with crush dressing, and with considerable success.

These experiments, however, were exploratory rather than definitely conclusive—that is, independent development precluded any standardization of crush dressing devices. Then, America's entry into the war, and the sudden upsurge in war production, started an intensive research and development that, in a remarkably short time, all but revolutionized the mass production grinding of intricate forms.

Among those who have contributed to this development, The Thompson Grinder Company, of Springfield, Ohio, and the Sheffield Corporation, Dayton, Ohio, have played leading roles. Thompson's part, in this development, is told by J. C. Wilson, Chief Engineer of the company.

Sheffield's contribution to the technique has been considerable, not only in developing and engineering crush dressing devices, but in the manufacture of simple and semi-automatic crush dresser units. In addition, the company has been active in propagating the technique, and outstanding papers by Messrs, W. Fay Aller, Carl J. Linxweiler and Richard Y. Moss, respectively director of research, manager of machine tool distribution and production engineering manager at Sheffield, have done much to acquaint industry with its possibilities.

While the Sheffield Corporation has not directly contributed a paper to this Symposium, both Mr. Linxweiler and Moss took active parts in the Forum on Crush Dressing held by Detroit Chapter, ASTE, as did Mr. F. L. Curtis, sales engineering manager for Norton Company, Worcester, Mass.

However, it is not our purpose to leave two such outstanding contributors to grinding techniques—as Sheffield and Norton—out of the Symposium. We therefore include a pictorial story of Sheffield crush devices and their application to precision form grinding, and, as a closely related subject, an excellent article on *Abrasives and their use in Industry* by a Norton field engineer—Mr. O. McIntyre of Norton Co. of Canada, Ltd.

Taken as a whole, we have covered practically every angle of crush dressing as far as the technique has advanced up to this time. The article by Mr. Bellamy presents the subject from the viewpoint of the abrasive engineer, while Messrs. Moreland and Kitchen present practical applications from the viewpoint of master mechanics in industry.

Andrew E. Rylander

Technical Editor.

orm Tool Grinding

grinding wheel is reduced, the hardness of the wheel is ected to the point that the bond will break down readily allow the wheel to be formed according to the shape in hardened steel roll. With the application of this process were able to get the desired results on the steel wool tools.

Later, it was necessary to produce serrations in such ms as high-speed steel-inserted milling cutter blades. After tensive experimentation with this work, satisfactory results ere ultimately obtained both in high speed steel and in tellite.

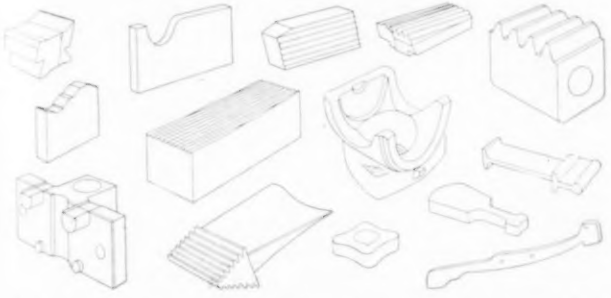


FIG. 1. **Precision contours, ranging from fairly simple to highly complex shapes, as produced on Crush Form Contour Grinders. Note the gear tooth shapes, accurately formed.**

The crushing and truing device developed for these early applications is basically the same as the mechanisms which form an integral part of surface grinders provided, today, for precision contour production. That is, they consisted primarily of a hardened steel crushing roll mounted on a spindle which is supported in super precision ball bearings. On most applications it was desirable to drive the spindle and idle the wheel, in which case the spindle was driven by a ¼ H.P. geared head motor through Vee Belt Drive, and the crusher roll operated at a peripheral speed of approximately 300 surface feet per minute.

The truing device was mounted at the end of the work table of the surface grinder and the wheel truing or crushing device was then lowered until contact was made with the crusher roll. The attachment was then started by energizing the geared head motor and the operator proceeded to lower the wheel head, feeding the wheel to full depth. Care had to be exercised, to prevent letting the wheel idle on the crushing roll without feeding, in order to prevent lapout of the crushing roll and resulting loss of shape. After this complete hand operated process, the wheel was ready for grinding the work pieces.

Development Results in Unit Design

Early in the development of the crush form contour grinding process, as applied to surface grinders, it was discovered that any machine, which could crush and true by the most economical method and grind to close tolerances in the most efficient time, would have to be completely engineered as a unit and designed to the job. The reasons for this conclusion are quickly evident when all the factors involved are considered separately and collectively.

First: there is the contour itself which requires special analysis in order to be able to determine whether or not production on a crush form contour grinder would be practical. And, if practical, to determine the most efficient method of crushing the wheel—the hardness, composition and design of the crusher roll and other factors involved in the process.

For example, various methods of crushing procedure have been used. The question arises whether the crushing roll should be driven at a reduced speed. Very satisfactory results have been obtained by both methods. Where very wide contours are to be produced, or extremely heavy spindles are used, we recommend the driving of the wheel head at reduced speed rather than driving the crushing roll.

A decision has to be made as to the coolant, as various types are used. However, in most cases a good grade of thread grinding oil is desirable as this tends to hold the form on the grinding wheel and at the same time greatly assists in crushing the wheel.

Another important consideration involved in engineering the crushing method is the crusher roll itself. While most crusher rolls are made of high-speed steel having an analysis of 18% tungsten, 4% chromium and 1% vanadium, and are hardened to a Rockwell reading of 65C to 67C scale, very satisfactory results have been obtained with the use of soft steel rollers for the reproduction of irregular shapes in grinding wheels where the tolerance on the shape was not too close and where only a very small quantity of pieces were required.

As to the various methods of relieving the crusher roll to permit the removal of the abrasive parts which are apparently crushed from the wheel when forming, considerable discussion has been presented. However, some crusher rolls have been supplied with helical gashes or slots irregularly spaced, which do have a decided effect on the life of the roll when a comparatively deep contour is generated in the wheel. For example, one particular job consisted of grinding a ⅜ inch radius with two reverse curves and two flats into an aluminum casting. Better results were obtained by gashing the crusher roll, on thread forms, especially pitches ranging from 10 to 32, and the various sizes of serrations that are applied to inserted milling cutter blades, the gashes are not required. for equally good results are obtained with perfectly smooth crushing rolls.

FIG. 2. **Examples of various master crusher rolls.**

FIG. 3. **Fully automatic Crush Form Contour Grinding. A completely engineered unit designed for mass production of contour work. It is also capable of conventional surface grinding.**

Second: there is the application of the machine, not only for crushing and truing operation but for grinding as well. For example, on the grinding of a tangent type chaser, which is a difficult job to perform, the machine must be equipped with a ball bearing spindle and must have slow table speed so that the thread form can be ground to within a few thousandths of finished depth at one pass, operating at speeds ranging from 3″ to 7″ a minute. This also protects the thread form on the grinding wheel as the corners of the wheel approach the work piece slowly.

On precision contours where there are generous radii on the wheel, grinding is accomplished at 100 ft. a minute, with intermittent down feed. Other jobs have been roughed out at a table speed of 50 ft. a minute to within .010 of finished size and then after the wheel was redressed, the final pass was made at a table speed of 3 in. a minute. These are only a few typical examples to illustrate the variables involved in the designing a machine to the job.

A third factor involved is the production requirements of the manufacturer. For example, where mass production of

The photographs—Figs. 4 to 11—show the progressive sequence of operations required to produce the tangent type thread chaser shown in Fig. 4. Forming of the original master roll is shown in Fig. 5. This is being formed under carefully controlled conditions, in the Crush Form Contour Grinder Development Laboratory, to insure extreme accuracy. After forming and finishing, the original master roll is carefully checked on a comparator, as shown in Fig. 6.

Although they may be made by the same procedure, on the fully automatic machine, duplicate master rolls are being produced (Fig. 7) on a CFC—Type B Grinder. The crushing operation is shown, wheel idling. Fig. 8 shows the grinding of duplicate rolls from blank, with formed roll and wheel both idling. After wheel is positioned over the roll, grinding is started and proceeds without interruptions until full depth is reached.

First step in actual production of thread chaser is shown in Fig. 9. Here, the contour of the thread chaser is transferred from master crushing roll to the wheel of the fully automatic Crush Form Contour Grinder in the crushing operation, prior to production grinding. Operator positions wheel over roll and presses inching button—crushing proceeds with automatic down-feed and limit control. (On deep contours automatic up-feed returns head to starting position.)

Fig. 10 shows production grinding of a shallow thread chaser contour. On this shallow contour, the table is moved directly into the grinding position, and a single pass made. On deep contours, after down-feed limit is reached, the machine automatically takes the required spark-out strokes.

The table automatically rapid-traverses to truing position from grinding position, as shown in Fig. 11. Truing is similar to crushing. Table then moves directly into grinding position and grinding cycle is repeated automatically. Crushing roll is set at finished work height on this contour, providing size control.

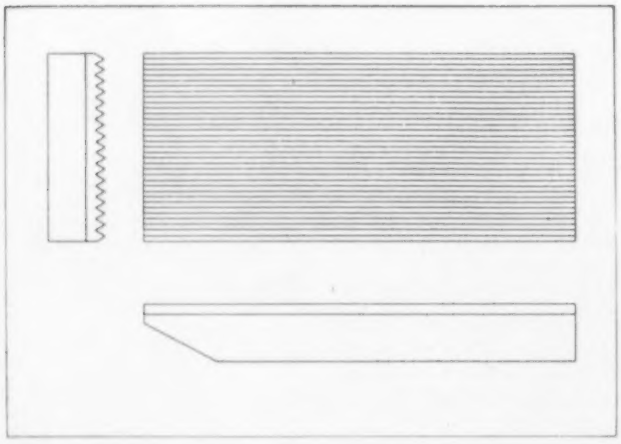
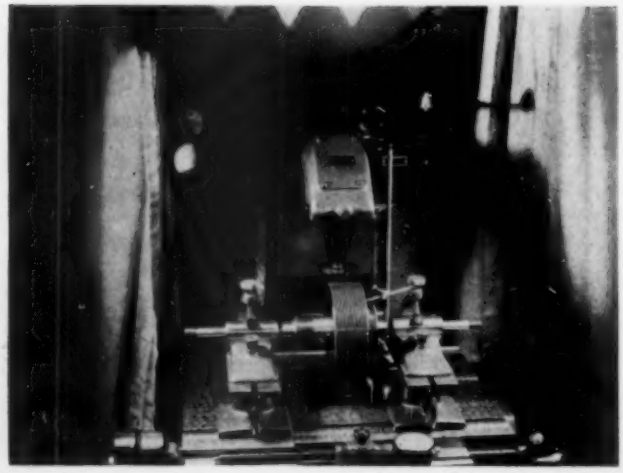


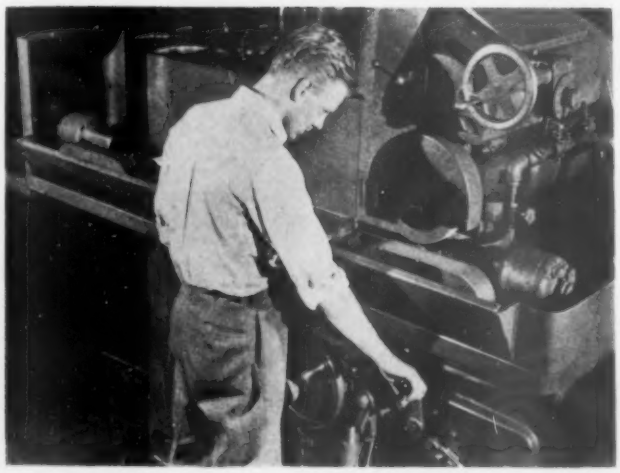
FIG. 4. Above.

FIG. 5. Below.

FIG. 6. Above.

FIG. 7. Below.





complicated contour is indicated, fully automatic control can be built-in which provides highly economical quantity production and, at the same time, assures a more uniformly perfect finished product through the elimination of much personal handling after original setup.

The fully-automatic crush form contour illustrated includes complete automatic cycles of operation and these cycles are interlocked electrically. Push-button controls are used to start and stop the machine through crushing, grinding and truing cycles. Automatic operation includes: down-feed, spark-out, up-feed, table positioning for crushing and truing. Automatic cross feed is also supplied but is used only when the machine is doing conventional surface grinding.

Dual-Purpose Machines

In spite of the specialization of these crush form contour grinders, they are also capable of conventional surface grinding. So, the purchase of a semi-automatic machine would be feasible even, for example, where ordinary surface grinding accounted for a large part of its use and where contour production was by job lots. Necessarily, since the fully automatic machine is usually designed for mass production of contour work, the investment is justified on that basis alone. However, even this fully-automatic machine also offers automatic production of standard surface grinding work.

Pictorial Explanation*

The accompanying sequence of photographs illustrate, more graphically than words, the exact order and method of contour production on a fully automatic crush form contour grinder. The second picture indicates the contours to be produced. The second series of pictures shows how the original master crusher roll and duplicates are made, in the Crush Form Contour Grinding Laboratory. Machines are equipped for duplicating and this work can be accomplished in the manufacturers own plant. The third series of pictures show crushing of the wheel, production grinding and truing.

* These are the first pictures ever released of actual production on a completely engineered machine.

Development a Continuous Full Time Work

A completely equipped laboratory operates on a full time basis in order to develop further uses and improvements in crush form grinding precision contours on surface grinders. Refinements in methods and control are continually being discovered which are thoroughly tested and, after proving, are engineered into the next machines built. Results of this careful engineering and development are shown up favorably every day in the stepped-up production and increased accuracy made possible by these machines.

The Selection of Wheels

by Leslie B. Bellamy

THERE have been many developments, during the last few years, in the application of crush dressed grinding wheels for form grinding. Originally, research was devoted almost exclusively to thread grinding with multiribbed wheels, but, in recent months, this method of dressing wheels has been applied to produce many other intricate forms.

FIG. 8. Above.

FIG. 9. Below.

FIG. 10. Above.

FIG. 11. Below.

Primarily, wheel crushing was developed as an alternative to diamond dressing, and as a less expensive way of producing desired forms on wheels. However, wider fields have been developed that, from an operational cost standpoint, have far greater significance than the original goal of simplification of tool grinding set-ups.

Tungsten Carbide Favored

Generally, the crusher is a circular form tool of various diameters, identical in shape to the desired form required on the finished tool or part, and usually made of high speed steel hardened in the conventional manner. And, while it is interesting to observe that wheels have been successfully crush dressed with mild steel crushers without any hardening treatment, their life is naturally much shorter than that of the hardened rolls. Now, thought is being directed toward the application of tungsten carbide, as a crusher material, where long runs are required and where crusher costs can be amortized.

Leslie B. Bellamy, Technical Advisor with the Sterling Grinding Wheel Division, Michigan area, was born in Wales. He was formerly connected with Packard Motor Car Co. as Material Specifications Supervisor. He is a member of Detroit Chapter, A.S.T.E., of which he is Chairman of the Standards and Educational Committees.

Crushers are preferably mounted, in the holding fixtures, on antifriction bearings designed to permit free rotation and minimum of end play. The fixture is then mounted on the machine so that the crusher axis of rotation is parallel to that of the grinding wheel—or, inversely, the grinding wheel can be fed into the crusher. The peripheral speed can vary considerably, but experience has indicated that a range of 150 to 250 f.p.m. gives the best results. Although there is still room for investigation on this point, many advantages are being claimed for crushed dressing over the older methods and can be briefly summarized as follows:

1. Redressing of the wheel to the desired form can be done in a much shorter time; (2) a crushed dressed wheel is sharper and has better grinding qualities; (3) there is less pressure between the wheel and the work, and less heat is generated, making closer limits and tolerances possible, and (4) more pieces can be ground between dressings. Many of these advantages are so apparent, even at a superficial glance, that they merit the closest consideration.

Certainly wheels may be formed, by crushing, in a much shorter time than by any other method, with a marked reduction in time and costs and an equally apparent improvement in quality of product. It is fairly obvious that the time necessary to bring the crusher into contact with the wheel face, and to feed to a depth of .008" to .010" while the wheel is rotating at crusher speed, is a much quicker operation than having a diamond traverse the entire face area several times. And, a crushed dressed wheel is sharper and has superior grinding qualities.

In all forms of grinding, removal of the metal is accomplished by the abrasive grains penetrating the surface presented to it. Is is essential that the grains are kept sharp in order for the wheel to have a free cutting action. When diamond dressing, the diamond inevitably cuts across a percentage of the grains instead of tearing them from the bond post, thereby creating a flat or already semi-dulled grain condition. Microscopic inspection will show this dulling or flattening of the grain to be present to a degree that causes a burnishing instead of a grinding action.

The papers by Messrs. Bellamy, Moreland and Kitchen are resumes of a forum on Crusher Wheel Dressing at Detroit Chapter Meeting, A.S.T.E. July 12th, of which Mr. Bellamy was Chairman.

With crusher dressing there is a minimum of disturbance; as a result, the grains are left sharp and free cutting, with a minimum of glazing. Hence, closer dimensional tolerances can be held.

More pieces can be ground between dressings, and longer wheel life is obtained. These advantages are also the direct outcome of the improved grinding action of the crushed dressed wheel. With improved grinding qualities, it is axiomatic that the number of pieces that can be ground between dressings would be increased and longer wheel life obtained.

Wheel Selection: Although much has been done regarding the type of wheels best suitable for crush grinding, and while certain factors are fairly established, only a very broad generalization can be made here. We know that, when selecting the proper grinding wheel for a particular operation, we must consider the following factors when making wheel recommendations: (1) The kind of material to be ground; (2) the amount of stock to be removed; (3) the gaging limits and the surface finish required; (4) the area of contact between the wheel and the work; (5) the type of grinding machine and its condition; (6) work speed; (7) wheel speed, and (8) the type of operation.

With this information available, the abrasive engineer should be able to recommend or select a wheel that will embody the advantages enumerated. Wheels are generally of finer grain and tighter structures for crush grinding and surface grinding machines, taking 7" to 12" diameter wheels with grits of 80 to 150 and grades between I and K employed. For O.D. and plunge grinding, 120 to 220 grits and grades from K to N are generally used. It has also been the experience of the writer that better grinding action is obtained with the regular grains rather than with the more highly refined or premium grain wheels.

The tougher clay bonds also enable the wheel to retain its form for a longer period than some of the more friable glass bonds used. The points mentioned here, regarding wheel selection, are necessarily brief, and considerable detail has been omitted, but they do indicate the path that must be followed toward intelligent wheel selection.

The "shoemaker to his last," and undoubtedly the best procedure is to leave wheel recommendation to the abrasive engineer. There are many pitfalls in the way of the uninitiated, who may, therefore, miss out on the fullest realization of crusher dressing as outlined in this Symposium.

The Tools for Crush Dressing

by L. A. Kitchen

FOR those who are unfamiliar with wheel crushing, a brief description of its use, as applied to the tool room and production, may clarify the procedure. Considerable engineering work has been done on wheel crushing, both in Europe and America, and at the present time we are using it more and more as shop men find out how easily and quickly difficult forms may be ground with crusher dressed wheels.

A simple crusher, for surface grinding, consists of a "U" shaped fixture with holes through to mount a shaft. Upon the shaft is mounted a high speed steel disc, the reverse of the contour form you wish to crush into your grinding wheel. With the disc mounted, and power off, the grinding wheel is placed above the form. You are now ready to start crushing.

Feed by hand, bringing the grinding wheel directly into the form, and at same time commence turning the spindle

with a crank. This, in turn, will rotate the crusher. Keep this up with plenty of down feed until you have crushed the complete form. When the form is completely crushed into the wheel, remove the crank from the spindle. Then, remove the fixture, place the work on the chuck, apply power and you are ready to grind tools.

L. A. Kitchen **is Assistant Tool Supervisor at Buick Motor Division, G.M.C., Flint, Mich. Long associated with the automotive industry, he has been active in the design, development and manufacture of tools for mass production. He is a member of Flint Chapter, A.S.T.E.**

Here, a word of caution. That is, never let your master and grinding wheel run free, or you will have a reverse action in which the grinding wheel will commence to grind the form. When crushing the wheel, take plenty of time to make sure that the wheel is crushing round; if not, a poor finish may result. In this connection, we have found that lead centers in grinding wheels are inferior to the hard center wheels. This is due to point contact between wheel and crusher and, the lead being soft, there is a tendency toward out-of-rounding the bushing holes.

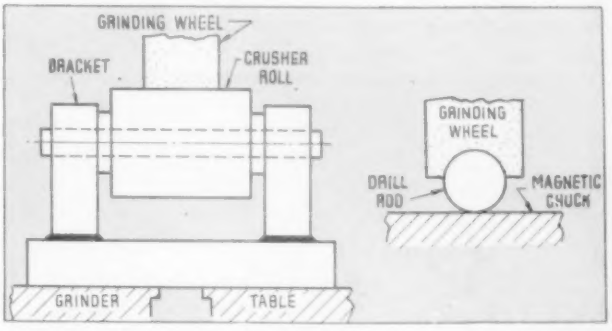
Drill Rod Used for Crusher

One thought, on reduction of diamond cost—or the elimination of diamonds on some jobs—in some factories, may be worth passing along. If you can crush wheels to any form desired, then, by the same token, you can also dress a wheel with a round, parallel face disc crusher and do an excellent job, thereby eliminating diamond dressing tools. Another new method, which is rather interesting is this: In times past, when you wanted a radius dressed in a wheel on a surface grinder, you had to have a wheel dresser and a special set-up. But, the following is something you can use, and it is fast and accurate:

Get a round piece of drill rod—or cold roll steel—of the diameter to produce the desired radius, lay this on the magnetic chuck, bring the wheel down to the rod and continue to crush until the desired radius is crushed into the wheel. Circumference of the wheel should not exceed length of chuck for best results. At present, however, the round crusher seems to be more or less universal.

Here is another "new" to work on. On surface grinding jobs where the wheel circumference is within the chuck length, try this crusher:—Instead of using a round crusher, make it flat, with the desired form, then cut in grooves, right and left, at an angle of 45° criss-crossed and spaced about 1" apart. This method is as good as the round crusher. The reason for the grooves is so that wheel grains will not lay on the crusher, and also to relieve wheel pressure.

Now comes the question of diamond dressing vs. wheel crushing. Wheel crushing will not eliminate the diamond, but, it has been the writer's experience that crushing gives a true picture of grade and grain of wheel, as crushing breaks out new sharp grains and will repeat the same dressing at all crushings. This does not seem to be true with diamond dressed wheels, as many times the day crew will get good results from a wheel which the night shift will criticise.



Simple construction of parallel face crusher roll.

Crush dressing radii with drill rod.

We have found that, on the average, the crushed wheel will produce more pieces per dressing than a diamond dressed wheel. At the present time, crusher life averages from 50 to 80 crushings, depending more or less on the operator who, if not properly instructed, can ruin the crusher. One thing to remember is that, when dressing down, do not move crusher sideways at any time.

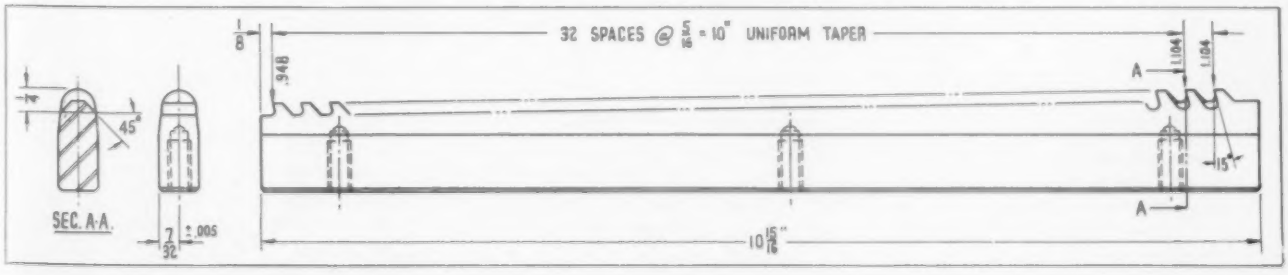
Crushers should be made of high speed steel, as GM T-lor M-2, hardened to Rockwell "C"-64-66. However, we have tried GM-46M tool steel and find it very good—in some cases much easier to grind than high speed steel. Some thought may be directed toward making crushers from impregnated carbide inserts, although, so far, we have not tried this.

Hardened Rolls Not Essential

Bear in mind that any wheel can be crushed to practically any contour with forms which can be turned out on a lathe in a short time. And it is not necessary to harden the form; however, the more accurate the crusher, the more accurate the ground piece. Most of our round crushers, at this time, have standard 2 inch diameter holes. At the present, we find slots to be unnecessary in crushers.

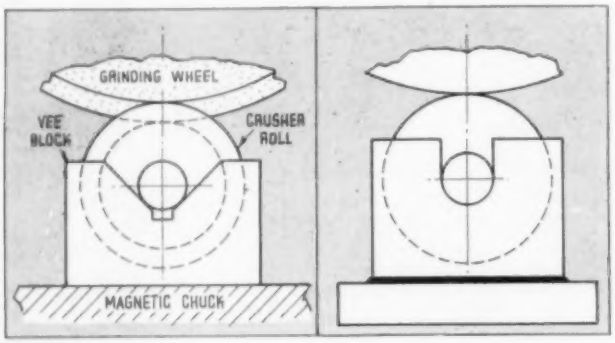
As to the question of turning the wheel or turning the crusher; this has no bearing on the job and you may use whichever is most convenient. On surface grinding, we crush the wheel dry and grind dry, and here is an important consideration, and that is to place a stiff brush against the

Form contours on broaches ground with crush dressed grinding wheels.



crusher, and one against the wheel, to clean the wheel completely of grit. Our tub and cylindrical grinders, using crushers, are run with compound. We have tried mineral seal oil, but find that it does not clean the wheel completely, also it is very messy.

There is no rule, to the writer's knowledge, which gives the ratio of crusher diameter to wheel diameter. It all depends on the job and circumstances. However, here are a few of the ratios we have used:—a 5/8" diameter crusher, with 14" diameter wheel, with excellent results, and then a 4" diameter crusher with a 3¾" diameter wheel. On production, we have 7" diameter crushers with 30" diameter wheels. One seems to work as well as another.



Since pressure is downward, Vee blocks or open U brackets may serve as roll bearings.

Another consideration is that, on large or wide forms, the greater the amount of flat on surface area, the more power is required to drive the grinding wheels. And unless there is sufficient power, the wheels may stall; therefore, there may be cases where the work will have to be transferred to larger, more powerful machines.

Now, as to types of holders, for holding the crushers. At Buick, we have built our own fixtures—or brackets—in addition to the stock, purchased crushers. Here, we run the crusher roll shafts in enclosed Timken bearings; however, the shafts may be merely dropped into U shaped slots, or even into Vee blocks, since the pressure is entirely in one direction—that is, downward against the table.

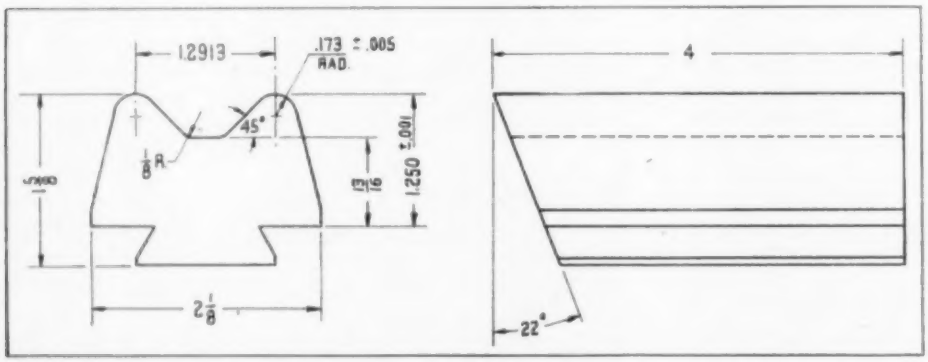
New vs. Old Machines

On surface grinding spindles, there exists a bad condition for both lead and hard center wheels. The spindle has threads so near the hub, for narrow wheels, that there is inadequate bearing for wider wheels when crushing. Crushing wheels should have good center bearing and, if possible, the wheel should be as wide as the job being crushed. On surface grinding, we have found that if a hand crank is screwed on to the threaded end of the spindle and cranked, it is possible to feed down with other hand. However, any method of wheel turning and crusher feeding will do a good job. As for time saving on surface grinding, we can cite a good example of 6 checking tools ground from rough to finish in 30 minutes that, with diamond dressing, it would take around 8 hours. A good average is 20 tools roughed out per wheel crushing and 30 tools finish ground per crushing. As to crushing a sharp corner, we are easily able to get a .004 radius, and with care can get down to .002 radius. At the present time most of our crushers are ground on Brown & Sharpe No. 13 and, in the near future, we expect delivery on a Sheffield form grinder.

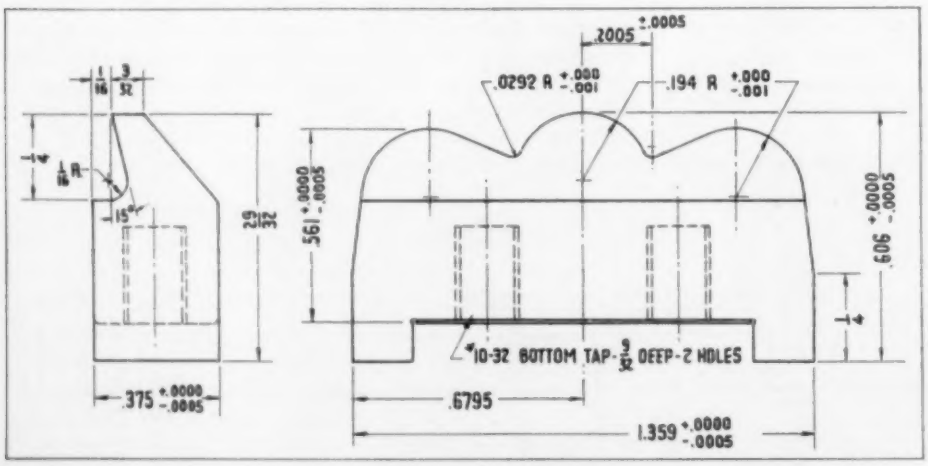
Hole size of the crusher is 2⅜ with 5" outside diameter, and the crusher turns about 225 surface feet per minute. Results on this machine have been very good, and large numbers of tools may be ground at one setting. On cylindrical grinding, we place the crusher on an arbor and run it between centers. It is revolved by head stock power, which in turn revolves the wheel. The crusher will revolve the wheel and motor very easily.

If, on the other hand, you have an old machine in which there is only one motor for both wheel and center head, release the idler pulley so that power will be removed from the wheel spindle, and then apply power to the head stock and force the crusher into the wheel. Apply plenty of compound, and revolve the crusher at high speed, keeping plenty of pressure between the crusher and the grinding wheel.

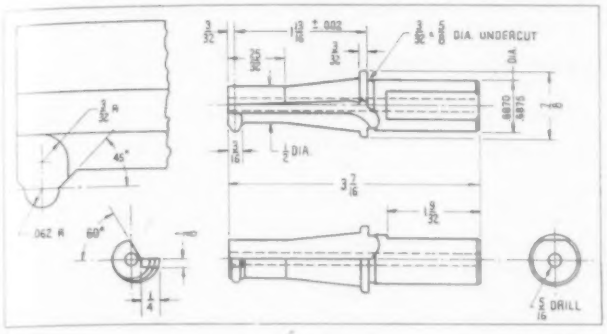
One of the jobs of carbide grinding we crush is as follows: We make a crusher and, as the form is not large, we crush three grooves into the wheel. The first groove is used for roughing, the second for semi finish, and the third for finish. This is large saver of time on tools of this kind.



Intricate forms ground by crush dressed grinding wheels. Note (above and below) close limits of tolerance on form tools illustrated.



We have, running on production, a few jobs on Pratt & Whitney aircraft parts. On one job, the crusher was not only a time saver but overcame a bottleneck on cluster gears as a diamond dresser was never able to produce a good form and at one time we were ready to say it was impossible to get the desired shape. This job was licked with the wheel crusher. The first crusher was soft, but the following crusher was made from GM-1020, carburized, hardened and ground, and produced very good results.



Typical example of small form tool ground with crush dressed wheel. Note limits of tolerance plus or minus .0005.

Another interesting production job was on a Pratt & Whitney crankshaft center section, where we form angles and chamfers. This job, at one time had two machines, one for left side, and one for right side form. Production from both machines was 5 per hour and after putting on a crusher—which produced a better job and eliminated one large Norton grinder—it increased production to 12 pieces per hour on one machine.

Applications Practically Unlimited

On this job, at present time, we are averaging 25 cranks per crushing, using a 30″ diameter wheel. A word, here, in regard to the proper wheel to use. We would recommend that you use the wheels which are on your machines to start with, as long as they are aluminum oxide or silicon carbide type with vitrified bond, and watch the finish. From our experience, you will go to a slightly softer grade, and in most cases a finer grain size.

Besides the Sheffield thread grinder, which uses the crusher for dressing, another machine—the Landis Centerless Thread Grinder—which also uses the crusher, is very interesting. It will grind centerless to Class No. 3 fit screws 12″ long for a size 4-40 pitch to 5″ diameter 16 pitch taken at one pass. On ¼″ screws the machine has operated continuously for 8 hrs. without recrushing the wheel. It has ground, in this time, 12,000 to 16,000 screws ½″ long. There is no question but that more will be heard of this machine.

The crushing of grinding wheels seems to have no end of applications. Speaking for ourselves, we have a complete set of male and female radius crushers from 1/64 to ½. Sets like this, once made, will last indefinitely and greatly speed up form work. Crushing is here to stay and the future will bring grinding machines designed exclusively for this type of dressing. Form crushing is a great time saver and, if your crusher is o. k. for dimensions, all form tools ground from it will be the same.

For the development of crush dressing of grinding wheels at Buick, the writer wishes to give credit to the following men: Norm Harvey, Superintendent, and Messrs. Fred Forester, Howard Dayringer, Joe Fetzer, Frank Dunn, Jack Runala, Cecil Bendle and John Clark.

The Economics of Crush Dressing

By Wm. Moreland

WHILE not a new technique, since it has been in use abroad in various forms and over a period of time, it is only of late that the crush dressing of grinding wheels has gained impetus here in the United States. This delay, in acceptance, may have been due to misconception and misunderstanding, many people having believed that crush dressing could only be utilized for long production runs.

Others, again, may have believed that crusher cost is too high to offset other savings, and it may have further appeared that set-up and dressing time would be longer than, say, diamond dressing, thereby adding to overall costs. And it is true that all of these conditions have a bearing on the final results, yet, careful analysis shows that crush dressing can promote efficiency and cut costs in every case where it can be practically applied.

Objections Held Invalid

It is the writer's belief that most of the objections to crush dressing can be logically overruled, and that many advantages—as quality, precision and increased productions—can be gained by use of this principle of wheel dressing. In this spirit, and in the hope that unbiased and constructive criticism will in turn evoke a greater interest, this article presents the user's side of the question of crush dressing of grinding wheels.

Wm. Moreland **was born in Pittsburgh, and served apprenticeship as tool and die maker with Ford Motor Company. He also studied mechanical engineering at the Ford School. He joined the Chrysler Corporation in '33, and since '42 has been in charge of the Mechanical Division of the Chrysler Gun Plant. He is a member of Detroit Chapter, A.S.T.E.**

We are grinding, at Chrysler Jefferson, one particular tool, in lots of 20 pieces, that formerly took 4 operations totalling 30 minutes grinding time per tool. We now do the job in 2 minutes per tool. The average set-up and wheel dressing time per tool is now 40% less than the old method. With a saving of ½ hour per tool, times 20 tools per lot, we save about 10 hours during each run. Even should the crusher wears out after only 10 dressings—which is ridiculously low—the total savings would then be 100 hours. And a crushing roll can be made in less than 20 hours.

In this particular case the crusher has paid for itself on 40 tools. That, however, is only one example, yet, shows that crushing is not limited to long production runs. It further establishes that crusher cost can be quickly amortized. If you still think set-up and dressing time are hindrances, here is another example:

From 19 Minutes to 1¼ Minutes

On another form tool, ground in lots of 20, the three operations which were required of the old method took 19 minutes grinding time per tool. With crush dressing, the time is 1¼ minutes grinding time per tool, with 30% less set-up and dressing time. At 20 minutes saving per tool, 60 tools would more than pay for the cost of the crusher.

And what about tools on which savings of 30, 40 or even as much as 50 minutes per tool have been effected? These are not unusual savings, as exemplified by a broach form that, formerly, required 7 operations and 1½ hours grinding time.

It is now being done in one operation, by means of crush dressing, in ½ hour. Another similar job, that formerly required 3 hours of form grinding, is now being done in 1 hour. On these two jobs the crushers have been used over 50 times each and are still producing a satisfactory form on the wheel. On still another job—grinding corner rounding cutters for gear teeth—the crusher is still satisfactory after more than 120 crushings.

Old Cutters Used As Rolls

In this connection, however, the writer's experience with crush dressing has been confined mainly to cutter grinding which, in his opinion, present the greatest opportunity for savings. This opinion is based on the fact that most shops are still grinding forms the way they were doing it 25 years ago—in other words, one radius or one angle at a time. This entails many set-ups and different dressings of the wheel. But when the complete form can be ground at one pass the job becomes simple.

There are records that show reduction in time of as much as 50 minutes per tool bit on surface grinding work. For instance, one company is form grinding serrations in clamp jaws in 10 minutes that formerly took 1½ hours, and savings like these more than offset the cost of the crushing rolls. For that matter, the roll cost can be reduced considerably by using worn-out milling cutters as blanks and grinding the form on them. After the first satisfactory roll is made many more can be manufactured cheaply by crushing the form on the wheel of a cylindrical grinder and using it to grind the succeeding rollers. Always keep one roll as a master to crush the form in a wheel to regrind rollers when they lose their form.

Unit Costs Small When Prorated

While the cost of first crushing roll is high, cost can be reduced tremendously by making them in sets of three or more. This is done by keeping one roller as a master in the tool room. When the crusher used by the operator is worn to the point of no further use, it can be redressed by using the master to crush the form in the grinding wheel of the cylindrical grinder. The worn crusher is then ground and becomes the new master. The old master is turned over to the cutter grinder operator to be used as a working roll until it becomes worn. The third roll is of course in use by the operator during the redressing period.

When savings are figured, in grinding form tools, of as much as 30 minutes per tool; 40 minutes per tool; 50 minutes per tool, and as much as 40 percent in set-up time, crushing roller costs are very small when prorated over a large number of tools.

There does not seem to be any consistent standard of how long a crushing roll will retain its form. This is due to varying shapes and also to the fact that different requirements of accuracy have a great bearing on usable life. On some jobs the roll lasted for 150 crushings, on others for only 10, but it seems that metallurgists should be able to produce a material that would raise the usable life over what we are getting now.

Better Roll Material Needed

Nitriding shows some promise, and very good results have been obtained from tools of cast high speed steel. We are experimenting with crushing rolls made of this material; certainly, however, there is a great field for improvement in crushing roll material. Perhaps carbides will answer the purpose except that the higher cost would have to be reckoned with in this case. Especially so since one very important factor in roll life is the diameter. Obviously, the larger the diameter the less wear on the form of the roll.

Experiment and experience to the contrary, the writer has been trying to get the answers to some of the problems in crush dressing of grinding wheels, hence, is somewhat reluctant to tell of ways and means of solving them. And with all due respect to the machine tool builders and grinding wheel makers who have contributed so much to this process, there is some ground to believe that their respective industries overlooked a great opportunity to further the war effort, especially in view of the fact that crush dressing is an old principle that has been used in Europe for a good many years. This, of course, is a matter of personal opinion.

Wheel Balance Held Essential

One of the greatest drawbacks to gaining all the advantages of crush dressing is due to not being able to take a grinding wheel off the spindle and put it back on without redressing. There are many times, on short run work, when the wheel is still in good condition when the lot is finished. We should be able to save that wheel for the next run of the same piece, but with hole sizes varying, and wheels not perfectly balanced, we have to redress every time it is mounted. That is where wheel costs mount and crusher wear increases.

The grinding wheel manufacturers should concentrate—that is, if it can be practically done—on giving us better balanced wheels—and by that is meant wheels that will stay in balance regardless of the number of times they are dressed. The inside diameters of the wheels must be maintained within .001 for size and roundness. The grinding wheel manufacturers claim that their commercial standard is from .002 to .005 plus, but many wheels are received .008 to .010 plus.

In the writer's opinion, all wheels for crushed dressing should be manufactured with bushings or else sprayed with lacquer on the inside diameter. It may be necessary to use a steel insert held in place by lead in order to maintain the accurate hole size required. In this way we would be able to remove and replace grinding wheels without reforming. This would reduce set-up time, wheel wear and crusher wear, and would increase the numbers of pieces ground per crushing besides reducing machine loads.

Machines Should Be Improved

The machine tool manufacturers should give thought to the design and construction of grinding equipment in order to gain the potential values in crush dressing of grinding wheels. Comparatively few machines have rigid enough spindle construction to withstand the pressures required for crushing. Spindle diameters should be increased for more rigidity of grinding wheels during crushing.

Spindles are not adaptable for wide wheels. There is a demand for at least a 2″ width wheel on some crusher forms. Grinding wheel guards are not wide or deep enough to take required grinding wheels. Some tools with two angles, radii, etc., require laying on angle, equalizing wheel pressure when crush grinding. This takes grinding wheels wider than regular, to cover surface.

Some machinery builders, experienced in cutter grinding work, have developed special machines that are very handy for sharpening some types of intricate cutters. In machines of this type the spindle is only ½″ or ⅝″ in diameter for small cup wheels. On these types of machines it seems that an attachment could be designed to support the spindle in the female center for crush dressing on the wheel, which would lead to great savings.

Grinding machines should be designed with two-speed spindles; the low speed to give approximately 60 to 80 surface feet per minute during crushings. The change from high to low speed would have to be done quickly and easily without manual change of belts or gears, and spindle bearings

should be sealed to prevent the entrance of dust or emery. Bearings must be redesigned for increased side pressure.

Please do not misconstrue these criticisms, because, even with the objectionable items mentioned, crush dressing of grinding wheels is still, in the writer's opinion, one of the greatest ideas for increasing production, and for improving quality and reducing costs of form grinding.

Throughout this article, the aim has been to point out that if we all get behind this idea and give it the utmost publicity, and an exchange of the ideas of everyone concerned, crush dressing of grinding wheels may be improved manifold over its present stage of development.

Engineered Crush Dresses

by Gunnar Skog

While the Sheffield Corporation may be best known as a producer of fine gages and gaging systems, the company also manufactures precision form and thread grinders. Sheffield has also played a prominent role in pioneering crush dressing of grinding wheels for American industry, and in developing and engineering crush dressing devices. This development culminated in a line of simple and semi-automatic standard crush dressing devices admirably adapted to various types of surface and cylindrical grinders, of which a few typical applications are pictorially shown below.

Fig. 1 shows a powered crush dressing device for use with table type surface grinders. It is mounted on a wheel head slide and driven by a ⅓ HP geared head motor which is directly coupled to a grinding wheel spindle at the rear of the housing. This drives the wheel, at crushing speed, through an overrunning clutch which is thrown out of engagement when actual grinding starts. A close-up of the device is shown in Fig. 2.

While wheel spindles may be "cranked," as an alternative method, the preferred method is to have the grinding wheel revolve the crusher roll. Naturally, power turning of the wheel calls for reduced speed (hence the geared head motor) since crush dressing is only successful at low speeds. It is also essential that spindle axes of both crusher and wheel be absolutely parallel.

FIG. 1. **Sheffield powered crush dressing device especially designed for use with a table type surface grinder.**

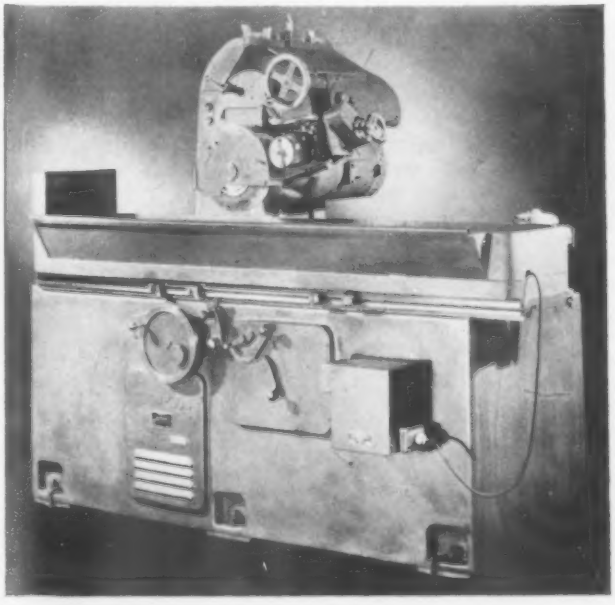


FIG. 2. Close-up of the Sheffield device for feeding the crusher into the wheel by means of an electric motor.

The above requirements can be met by mounting a roll crusher on the grinder table, locating it with tongues to fit the table slot; however, there is the disadvantage that the rolls may be in the way of the work and may further be spattered by abrasive loaded dust. Mounting the crushing device on the wheel head slide keeps it out of the way of the work and away from the coolant.

Such mounting, however, is preferred for the reasons stated and is not arbitrary. Numerous applications call for table mounted crush dressers, such as is shown in Fig. 3. This is a Sheffield motor driven crushing device for surface grinder application and, with a capacity for wheel dressing up to 3" face, may be used on any heavy duty surface grinder.

Fig. 4 shows a part in position for automatic cycle thread grinding on Sheffield Thread and Form Grinders. This semi-automatic power crushing device is located immediately above the wheel. The part being ground is hardened steel, and a ¾"—16 N.F. 3 thread is ground from the solid in 24 seconds.

Fig. 5 shows a work table for a precision measuring instrument, in which the face serrations are ground from the

FIG. 3. **Sheffield motor driven crushing device. Fixture will dress wheels up to 3" face and may be used on any heavy duty surface grinder.**

solid. The crushing device, and the 20" O.D. x 4" face wheel for grinding the serrations is shown in Fig. 6. This is a surface grinding operation, with considerable length of to and from travel, yet, the wheel holds its forms for a great number of parts.

Crush Dressing a Future "Must"

Master screws for lead screw tapping machines are shown in Fig. 7. These parts are of alloy steel, hardened to 62 Rockwell "C" scale, and are ground from the solid in one pass. Threads are 3 3/16"—16 U.S.F., 5" long, and held to within .0002" cumulative lead error with sharp crest and a maximum root width of .0004". Traverse ground with a 1" Multirib wheel, grinding time for the 16 pitch thread is 26 minutes, with 52 minutes allowed for a 32 pitch screw.

Fig. 8 also shows another precision grinding job made possible with crusher dressing. The part shown is a small vane (compare with 6" scale) such as is used in axial flow compressors. These parts are ground from solid rectangular steel, hardened, in two operations for two contour sides. Profile limits of tolerances are held to plus or minus .0005" throughout, and such precision may be consistently held throughout long production runs.

From the foregoing examples—and they are but a few out of many—it will be seen that crusher dressing of grinding wheels is not only conducive to ultra-precision grinding of forms, but that the method implies an increase in production that puts it among the "musts" of postwar production techniques.

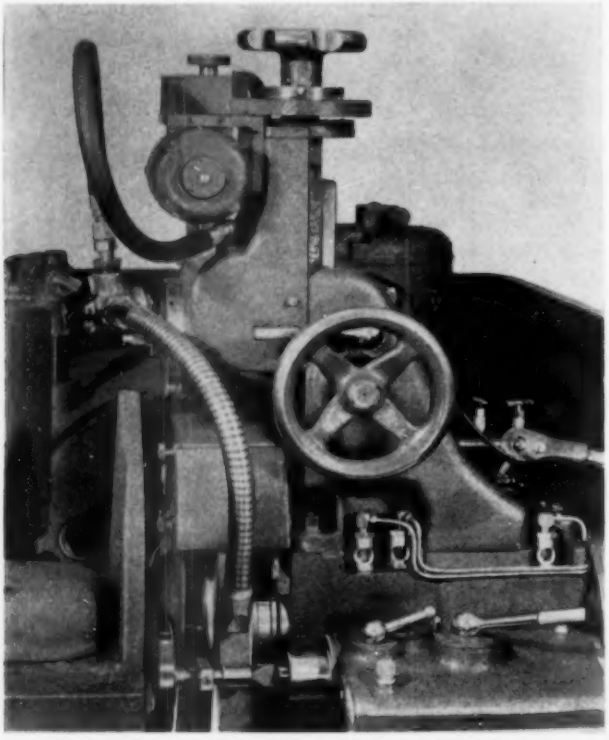
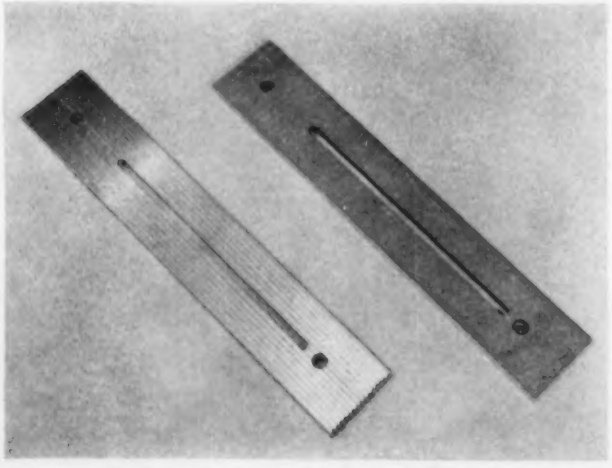


FIG. 4. Part shown in position for automatic thread grinding on Sheffield Thread and Form Grinder. Semi-automatic power crusher located above wheel.

FIG. 5. Face serrations of work table for measuring instrument ground from solid after hardening.



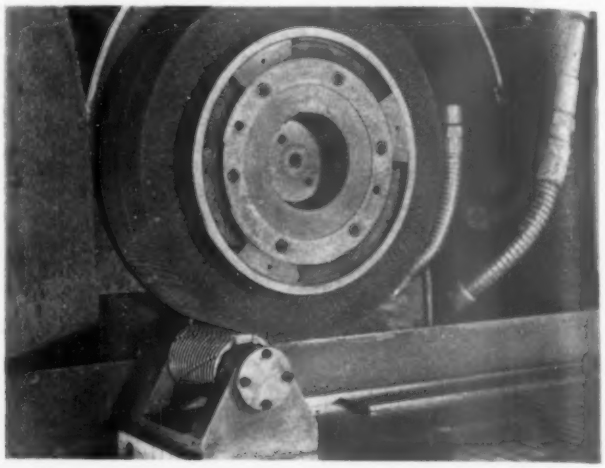


FIG. 6. Crushing device for dressing 20" OD x 4" face wheel used to grind face serrations on measuring instrument table shown in Fig. 5.

FIG. 7. Master screws for lead screw tapping machine, ground one pass with crusher dressed wheel.

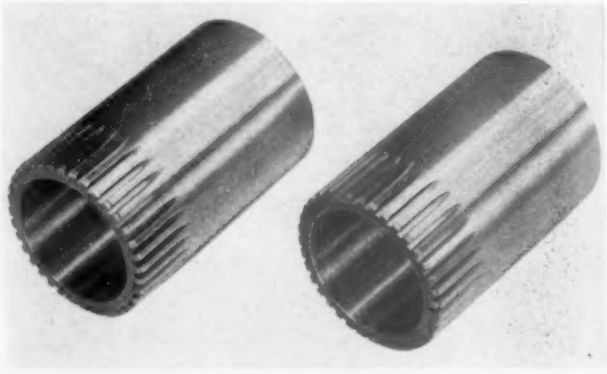
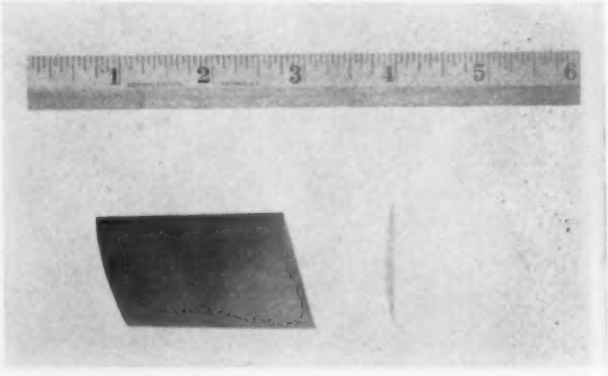


FIG. 8. Vane for axial flow compressors. Ground from solid rectangular hardened steel in 2 operations for two contour sides. Tolerances held .0005 throughout.



By O. McIntyre

Abrasives and Their Uses in Industry

Modern Abrasives are cutting tools which may be infinitely formed for intricate shapes and high quality surface finishes.

THE first grinding wheels used in industry were of the sandstone type, cut from sandstone quarries in various parts of the world. These were formed into the shape of a wheel. The natural sandstone, as you may know, is of very weak and soft structure and is not safe to operate at high surface speeds. It has been used largely in the glass, cutlery and axe industries. It is seldom used today, except in a few saw manufacturing plants and, to some extent, in the grinding of wood for pulp. It may still be found in rural places as the "old grindstone."

Grinding as we know it today is not an old art; most of the development has taken place during the last 50 years. With the development of mass production methods and harder metals and alloys, there came a need for harder and more efficient abrasive wheels.

In 1873, at the F. N. Norton Pottery Plant in Worcester, Massachusetts, the idea of making an artificial grinding wheel was discussed. The first wheel was made with natural emery as an abrasive and shellac as a bond. As time went on, other materials for abrasives and bonds were experimented with and developed until we have the present day products of the abrasive industry.

Orland McIntyre, Abrasive Technician with Norton Company of Canada, Ltd., is widely experienced in the application of abrasive products. A member of Hamilton Chapter, A.S.T.E., he has been a speaker on abrasive topics at the several Canadian chapters.

One of the most recent applications for abrasive wheels is thread grinding. Previously, threads had to be machine cut. This was a slow and, in a sense, an inaccurate method of producing threads. Since the development of thread grinding, a precision thread can be produced and duplicated on a mass production basis. The ground thread is more accurate, has a higher surface finish, and on some operations or applications has as high as three times the life of a machine cut thread. Threads may be ground internally or externally and, in the smaller sizes, "from the solid." Some of the larger diameters are first machine cut and then finished ground.

In thread grinding, both vitrified and resinoid bonded wheels are used, usually 18″ to 20″ diameter, ⅜″ in thickness and having an 8″ or 10″ hole. It may be said that the vitrified bonded wheels are mostly of the special aluminum oxide abrasive type in grit sizes from 80 to 320, medium grades, open structure, and of a free, cool cutting bond. The resinoid bonded wheels used are in somewhat coarser grit sizes, using the regular type of aluminum oxide and in a very hard grade.

The fineness of pitch or root and form of thread are the main factors that govern the selection of grit size and grade required. Wheels of 150 grit in medium grades are being used with success on the more common types of threads up to 24 pitch. Finer pitches, such as 72, have been ground successfully with a 220 grit vitrified wheel. These wheels, vitrified or resinoid bonded, are made to operate at speeds ranging from 6,500 to 12,000 s.f.p.m.

In the development of thread grinding two of the major problems that had to be overcome were burning of the work and lead error. Considerable study had to be made in connection with these two problems. On the problem of burning, it was found that, in the case of coarse pitch threads, wheel speed often reduces this tendency to burn.

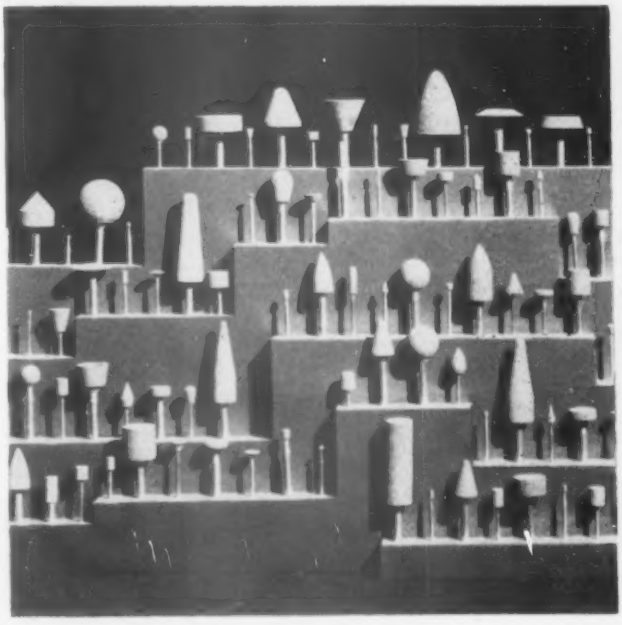
Sometimes inadequate flow of coolant or improper adjustment of outlet nozzle will cause burning. Use of the wrong grade of coolant oil can also cause burning.

There is a limit to the rate at which stock can be removed in thread grinding, even under the best of conditions, inasmuch as the heat of grinding usually increases with the amount of stock removed per unit of time. This varies with the class of material being ground. If burning should continue, you may be working too close to the border line and a slightly slower work speed, or a somewhat lighter feed should be tried.

Right Speed Eliminates Burning

On hardened steels, burning may be eliminated by increasing the work speed and reducing the feed in proportion. Where a relatively fine grit wheel is used to maintain a fine pitch or root, and also where the pitch is relatively coarse, having a narrow root, so that a large amount of material is removed, a higher wheel speed often reduces the tendency to burn. In some cases, reducing the wheel speed will reduce burning, but this is apt to cause the wheel to wear rapidly and also to lose its form.

Mounted wheels and points now a major item in grinding techniques.



On hardened high speed steel a change to finer grit or even a harder grade will often reduce burning. More heat is generated by the climb-cut than by the up-cut. By the "climb-cut" we mean the opposite direction of movement of wheel and work at the point of contact. The "up-cut" is just the reverse,—wheel and work in the same direction at point of contact.

Lead error, referred to above, is usually held to a small degree by the use of vitrified wheels due to the fact that the vitrified product will not deflect under pressure the same as an organic bonded wheel. With that, let us go on to other types of grinding.

About 30 years ago tool steel makers found that by grinding their billets and bars before finishing operations, they could produce steel of much superior quality. The oxidized surfaces were ground off to reveal hidden checks and seams which in turn were removed by grinding wheels. This grinding is done with swing frame grinders, usually mounting 14", 16", 18" or 20" diameter wheels of a coarse grit and fairly hard grade, resinoid or rubber bonded and operating at about 9,500 surface feet per minute.

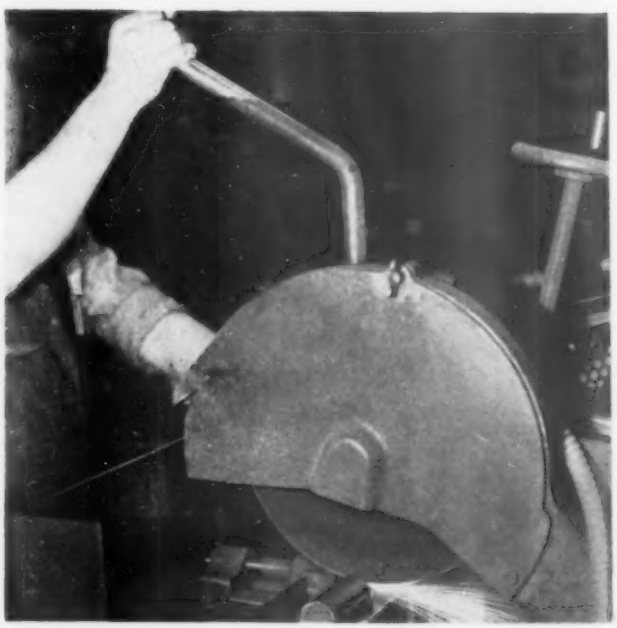
The reason for using a high speed resinoid or rubber bonded wheel is that it will remove metal faster and will produce better finishes than slow speed vitrified bonded wheels. Grinding cleans off the imperfections on the surface, making it possible to find the "seams."

A "seam" is known in the steel mills as a surface crack of hair-line dimensions appearing on the ground surface. If they are not removed, they grow in length and depth when the steel is rolled into the stock bar or rod.

Vitrified and resinoid bonded wheels, used for thread grinding, are 18" to 20" in diameter, with 8" to 10" hole.

Modern grinding wheels permit grinding threads from the solid, without previous chasing.

Grinding billets reveals flaws and results in higher quality of steel.



Finished bars are cut to length with thin rubber or resinoid bonded wheels.

When the finished bar or rod leaves the Rolling Mill, it goes to the Finishing Department for final inspection and to be cut up into required lengths.

This sizing into lengths is usually performed by the use of a high speed cutting-off machine equipped with abrasive wheels. These machines are usually of the wet type, with the coolant directed to the point of contact between wheel and material being cut. The cut-off wheels are usually 16″ in diameter, 3/32″ or 1/8″ thick, rubber or resinoid bonded, operating at about 10,000 s.f.p.m. on wet type machines and 16,000 s.f.p.m. on dry type machines.

Bearings Must Be Vibrationless

There are certain factors that must be taken into consideration for the satisfactory operation of high speed cut-off wheels. One is, that sufficient horsepower is required to maintain the surface speed during time of cut. If the wheel slows down during cutting, lower wheel life and increased grinding costs will result. Reduced wheel speed may also result in burning the ends cut, in some cases to the extent that further machining might be difficult.

The second factor to be considered is the spindle design for operating these abrasive cut-off wheels at the required relatively high speeds. To comply with the Safety Standards, the bearings must be of a high precision type and free from all vibration. The spindle must be equipped with flanges presenting a true radial bearing of 1/2″ width and at least 6 1/2″ diameter for a 16″ diameter wheel.

These abrasive cut-off machines and wheels are used in nearly all steel mills today with entire satisfaction. They are also used in numerous other fields, such as glass and aircraft industries, railway shops, track grinding and gold mines.

In the manufacture of coil springs for automobiles and trucks, the steel is received by the spring manufacturer in long rods of oversize dimensions. These have to be reduced to exacting requirements laid down by the automotive engineers with respect to size and surface finish. These requirements are met by passing long bars through a centerless grinder, removing as high as .009″ to .018″ per pass and at traverse speeds as high as 9″ to 12″ per minute.

After the bar has been reduced to proper size and finish, it is next coiled into the form of a helix spring. The ends of the rod on the last turn have to be ground off flush with the coil so that the spring will set square on the mounting. This is done on a disc grinder usually mounting a plate mounted abrasive wheel, fairly coarse in grit size, medium hard grade, resinoid bonded. The wheels are usually 20″ to 26″ diameter and 2″ thick. The spring is firmly clamped in a jig and oscillated back and forth across the wheel face. This squares the ends very rapidly.

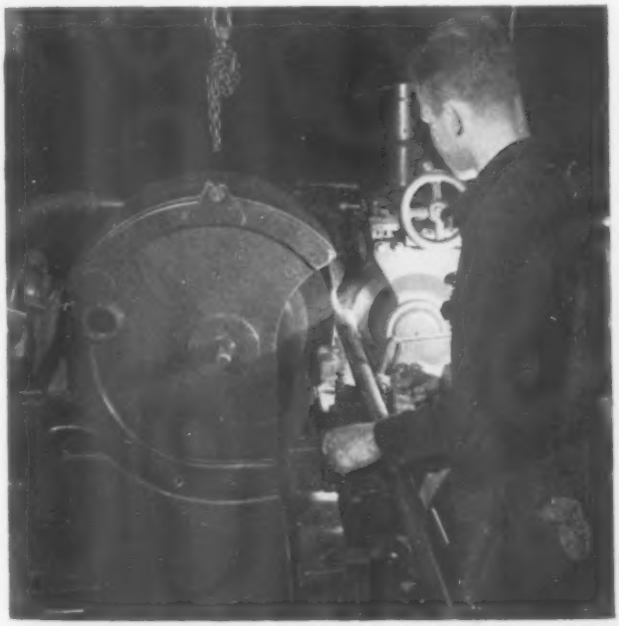
Now, let us look in on the tool manufacturer, who is making milling cutters, reamers, drills, taps and similar cutting tools. With very few exceptions, in the finishing of any cutting tool the final operations are done with an abrasive wheel of one type or another in order to produce keen and durable cutting edges.

A recent development in the regrinding of metal cutting tools is the addition of a fine finishing operation either by grinding or hand stoning. By this we mean that after the conventional 46 or 60 grit aluminum oxide vitrified wheel is used for sharpening (high speed steel tools), the cutting edges further refined by using a very fine grit, usually 320, shellac or resinoid bonded wheel.

Fine Finish Prolongs Tool Life

If you take a cutting tool and examine it under a glass after it has been ground in the conventional manner, you will be surprised to find that the cutting edge consists of "hills" and "valleys" created by the abrasive grains of the grinding wheel in the course of grinding. This sawtooth edge is weak and dulls quickly. By using a fine grit finishing wheel, these hills and valleys are removed, leaving practically a straight unbroken line. The result is a strong, keen cutting edge that will give longer life between regrinds.

For example, in a certain production shop where difficulty had been experienced in securing sufficient cutting tools, an abrasive engineer was called in to see if there was anything that could be done by grinding in order to prolong the life of their present tools. One of the tests made was on circular milling cutters. We took three cutters 4″ diameter, 6″ wide, having six teeth on a 52° spiral, and had them ground in the conventional manner, using a 60 grit aluminum oxide abrasive wheel. We then put them out into the shop and kept accurate records on their production. We reground them again in the



Centerless grinding of bar stock used for coil springs.

Flush grinding ends of coil springs for square seating.

same manner and then finish ground them with a 320 grit shellac bonded wheel. The results, in pieces per grind, were as follows:

Cutter No.	*Ground Conventionally*	*Fine Surface Finish*
1	16	27
2	19	31
3	13	29

We could write at great length on the different jobs that abrasive wheels are doing in the tool room, but first, let us say something on the grinding of carbide tipped tools. The use of carbide tools in industry is rapidly on the increase and one of the first things that has to be considered, when the installation of these tools is contemplated, is grinding. This need not present a problem today.

Special Machines for Carbide Grinding

There are machines on the market which are designed especially for grinding carbide single-point tools. These machines are equipped with an adjustable tool rest table to grind any desired rate and clearance angle on the tool tip.

Most tool rooms are using special silicon carbide abrasive wheels for the rough grinding of carbide tools and diamond wheels for the finish grind. There are some shops that still use silicon carbide wheels for both roughing and finishing. However, diamond wheels—either resinoid, metal or vitrified bonded—are much to be preferred to silicon carbide abrasive wheels for finish grinding particularly, because of their ability to produce keen, accurate cutting edges with minimum wheel wear and without danger of overheating and checking the carbide tip.

Because of the extreme hardness of the cemented carbides, the silicon carbide wheel must be of a very soft grade in order to insure a fast, cool cutting action. The result is a more or less saw-tooth cutting edge which, as explained before, is relatively weak and breaks down quickly, requiring frequent regrinding. By the use of a fine grit diamond wheel for finishing, this saw-tooth effect is eliminated.

For off-hand grinding, resinoid bonded diamond wheels are usually used in 220 grit size; metal bonded diamond wheels in 120 grit. As a rule, metal bonded diamond wheels are used only for off-hand grinding and for cutting off carbide blanks. The cut-off wheels are generally 4″ to 6″ in diameter and around 1/32″ in thickness. The popular grit size is 100.

For fixed feed grinding, as in sharpening carbide milling cutters, reamers, etc., resinoid bonded diamond wheels are recommended as they are very free and cool cutting and will not injure the carbide even if used dry.

Should a metal bonded diamond cup wheel become grooved or severely loaded or dulled, the face can be straightened and restored to its original sharpness in the following manner. Dismount the wheel and rub it by hand on a flat iron plate sprinkled with #150 or #180 silicon carbide grain. Use a figure eight rubbing motion and do not prolong the operation any longer than necessary to achieve the desired results.

In order to true a resinoid bonded diamond wheel, use a silicon carbide abrasive stick of medium grit size and soft grade. To clean or dress resinoid bonded diamond wheels, use nothing harsher than lump pumice.

Now let us go on to other types of grinding, such as surface grinding. The horizontal and vertical spindle type surface grinders are usually wet. Exceptions are the small 6″ surface grinders which are used principally for light tool room grinding.

Surface grinding, due to the relatively large area of contact between wheel and work, requires fairly coarse grit, soft grade, open structure wheels or segments.

Segmental wheels are recommended wherever the work will permit because of their cool cutting action and initial low cost.

Segmented and Solid Wheels

In a great many cases, by using a segmental wheel it is possible to go to a harder grade with the advantage of increased wheel life. For non-magnetic materials, and small pieces presenting considerable interrupted contact, the solid cylinder type wheel is recommended.

It is the writer's opinion that any grinding operations that can be done wet should be done that way for several reasons, among them that finer finishes are obtained and cooler cutting action results, and with wet grinding you are troubled but very little with the dust element, which is always injurious to precision machine tools.

Specially designed grinders should be used for grinding carbide tipped tools.

Wet grinding, on vertical surface grinders, reduces dust and improves surface quality.

Among the questions often asked the Abrasive Engineer is the horsepower required to operate efficiently a certain size of grinding wheel. If a grinding wheel is underpowered, there is always danger of it slowing down or stalling. This will cause chatter or scroll marks on the work and the wheel will appear soft, and break down rapidly. Here is a simple formula which has been found to be very practical: Take the diameter of the wheel in question times the thickness and divide by five. This will give you the approximate power requirement to operate a wheel efficiently. For example, an 18″ diameter wheel, 2″ thick: $\frac{18 \times 2}{5} = 7.2$ H.P.

More H.P. for Cut-off Grinding

However, this formula on horsepower does not apply to high speed abrasive cut-off machines. For the satisfactory operation of a high speed abrasive wheel 12″ diameter, 3/32″ thick, running at 16,000 s.f.p.m., at least a 7½ horsepower motor is required to prevent stalling under normal operating conditions. It has been found in actual tests that if this wheel should be increased to ⅛″ thickness, the horsepower should be increased to about 10 H.P. for satisfactory operation under the same conditions.

For operating a 16″ diameter wheel, 3/32″ thick at 16,000 down to 11,000 s.f.p.m., a 10 horsepower motor is required and here again, if the wheel were ⅛″ thick the horsepower should be increased proportionately to the increase in thickness.

The "Why" of More H.P.

An illustration will give you an idea why such power is required. A grinding wheel may be thought of as a revolving cylinder covered with a multitude of minute cutting points which are represented by the abrasive grains. These grains cut very small chips from the material being ground. It is the large number of cutting points and their frequent application which makes the grinding wheel such an effective cutting tool. As an example, let us take a 46 grit wheel, 18″ diameter, 2″ face, travelling at 6,000 s.f.p.m. There are approximately 38,800,000 cutting points that will impinge upon the work every minute. With this great number of cutting points contacting the work every minute, it can be readily understood that the power required to maintain the required peripheral speed for effective cutting by the abrasive wheel is large.

If you have a grinding wheel of the correct grit size and grade of hardness for a specific operation, these numerous sharp cutting points should be available throughout the entire life of the wheel. The wheel maintains its sharpness if, as soon as each abrasive grain becomes dull, the grinding pressure or stress tends to tear the dulled grains away from the supporting bond posts. This happens over the entire wheel face so rapidly in the normal use of the wheel that new sharp cutting edges are constantly presented to the work.

You may now ask why the new cutting edges do not break away from their new bond posts. The answer is that that newly presented grains are very sharp and readily penetrate the material being ground. The normal grinding pressure will not stress the bond posts to the breaking point until the abrasive cutting points have become dulled.

The Factors in Wheel Selection

Now, let us give you some factors which govern the selection of abrasive wheels. As a general rule, use aluminum oxide wheels for high tensile strength materials and silicon carbide wheels for materials of low tensile strength. Use fine grain wheels for high finishes, with the exception of cup or cylinder type wheels for surface grinding where, usually coarse grit, soft grade and open structure are required due to the large area of grinding contact. The smaller the area of contact, the harder the wheel, and vice versa. The higher the work speed with relation to work speed, the harder the grade should be and vice versa. Old equipment usually calls for a slightly harder wheel.

Use fine grit, hard grades for radius, form, corner or shoulder grinding. The finer the form, the finer the grit size and, of course, a slightly harder grade. Use vitrified wheels for speeds under 6,500 s.f.p.m. with very few exceptions, and organic bonded wheels for speeds over 6,500 s.f.p.m.

In the use of portable grinding machines, care must be taken not to operate slow speed vitrified bonded wheels on high speed grinders. Resinoid and shellac bonded wheels were developed for safe operation at higher speeds than vitrified bonded wheels and with a correspondingly higher capacity for rate of stock removal.

Another abrasive product that has developed into a major item in the past three or four years is mounted wheels and mounted points. These are small abrasive wheels, seldom over 1¼″ in diameter and 1″ thick or less mounted on steel spindles, usually ⅛″ or ¼″ diameter. They are made in both aluminum oxide and silicon carbide abrasives and in vitrified and resinoid bonds. Diamond mounted wheels are also available in a limited number of sizes for grinding cemented carbide.

Correct Surface Speed Important

They are usually supplied in three grit sizes—60, 90 and 120, of soft, medium and hard grades. Originally these mounted wheels were used principally in the tool grinding room but they have now been found very practical on production operations such as internal grinding.

One of the essential factors in using these mounted products is that sufficient speed should be available. For example, a mounted wheel 1¼″ diameter should operate at no less than 18,000 r.p.m. and as the diameter decreases, the speed should be increased in order to maintain a uniformly high surface speed. If these speeds are not approached, very little effective cutting action will result, due to the very small area of contact.

Summary of paper presented at a recent meeting of Niagara District Chapter, A.S.T.E.

War Inventions to Play Important Peacetime Roles

The three remarkable inventions brought out during the late war—the *reaction engine*, the *atomic bomb*, and radar—open vistas which, at this time, are but faintly realized. Of the three, radar wil doubtless be the first to be put into mass production.

Primarily designed as a weapon for defense, its future role will be that of guardian of safety for vessels and aircraft, and (who knows?)—for railways and automotive vehicles—perhaps entirely superseding the 'back seat driver." Instantly recording indentations in coastlines and surface contours, it will also find use in future geodetic surveys as well as for automatically plotting topographical maps.

As an interesting sidelight, radar has its prototype in Nature. That nocturnal flyer, the bat, which had its genesis in the remote reptilian age, uses the echo of its high frequency note to avoid obstructions in the way of its silent flight.

THE Fundamentals OF TOOL ENGINEERING

The Insulating of Wire

The insulating of wire, as used for electrical conductors, is one of the last operations in its manufacture. Rather, it is a sequence of operations that, as a rule, starts with rubber covering. This operation was described and illustrated in article No. 1 of this series—*The Extrusion of Soft Metals*—published in the March TOOL ENGINEER.

After rubber covering, the wire goes to the vulcanizers, and from there to inspection. At this stage, inspection consists of immersing the wire in water (usually a number of reels at one time in large tanks) and subjecting it to a high voltage charge. As the charge is several times higher than the current transmitted in normal service, any flaws or weaknesses in the covering will be indicated by "blowouts," which are then repaired and revulcanized.

The next step is taping, as shown by the machine in Fig. 1. Essentially, the machine consists of a frame, a take-off (in unit with the machine), an adjustable angle tape drum mounted on a counter-balanced flyer, a pull-out—or capstan—and a take-up, which may be incorporated with the machine or as a separate unit.

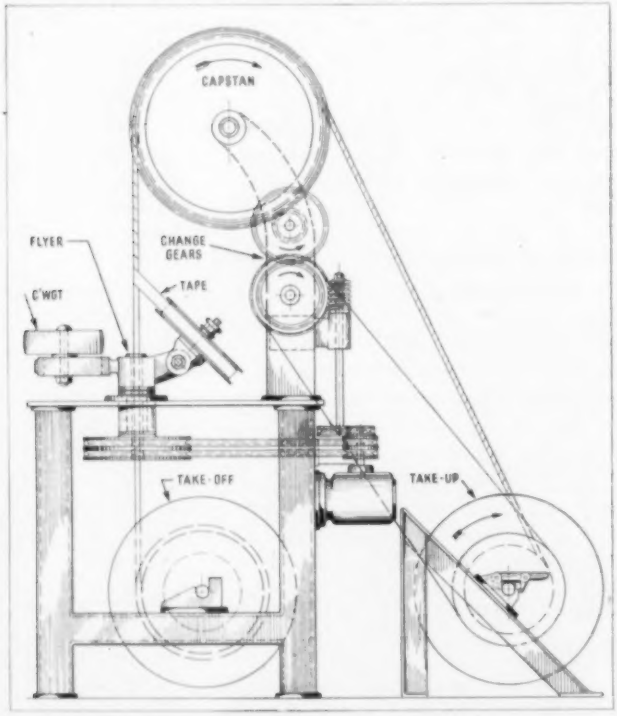
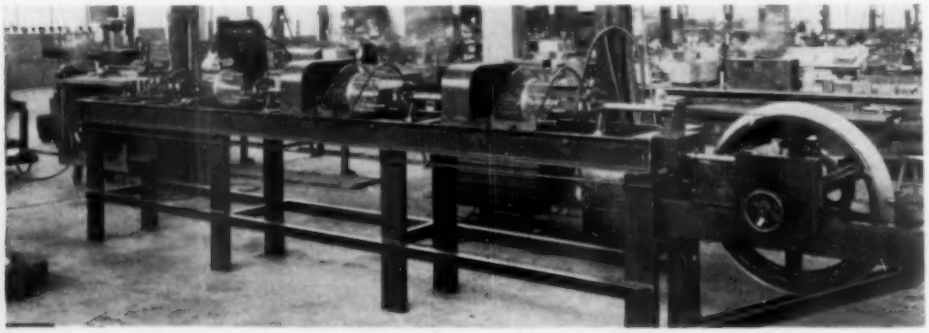


FIG. 1. Left. Diagram of vertical taping machine. Tape is wrapped as wire is pulled through by capstan.

FIG. 2. Below. High speed insulating machine. Photo by courtesy of Syncro Machine Company, Perth Amboy, N.J.



As in the case of stranding machines, described in the previous installment, lay of tape is governed by the ratio of peripheral speed of the capstan to the r.p.m. of the flyer, speed of the latter assumed to be constant. By changing the angle of the drum, and by increasing or decreasing the speed of the capstan (by means of change gears) tape may be widely or closely wrapped, as desired. The overlap, for 2″ wide tape, would be about ¼″.

As an alternative to taping, the wire may be merely yarn wrapped, and then waxed, as in the case of bell cord. Or, it may be wrapped with paper, or with varnished tape, with a yarn wrapper over that. A high grade, commercial machine for this purpose is shown in Fig. 2. This is a horizontal insulating machine made by Synchro Machine Company, Perth Amboy, N.J., and operates at flyer speeds from 800 to 4000 f.p.m.

This machine is primarily designed for winding cotton or paper, universally wound—i.e., wound on a Universal Winder—around the wire. By substituting a different type of flyer, however, as of the type shown in Fig. 1, the machine can be adapted to flat packages that may be applied from an eccentric or concentric arrangement.

Progressing from the first alternative—i.e., taping—the next step is braiding. Fig. 3 shows a braider of the "horn gear" type, originated and manufactured by the New England Butt Company, Providence, R.I. The bobbins, mounted on carriers, travel in opposite directions around the center and intertwine to lay a braid around the wire.

A more recent development, in braiders, is the high speed Wardwell, manufactured by the Wardwell Braiding Machine Company, Central Falls, R.I. While the principle of operation is similar—i.e., the intertwining of the yarn—application is radically different in that the bobbins are carried on drums spinning rapidly in opposite directions. In both types, the lay of braid is governed by the ratio of pull-out to carrier speed.

That is, the faster the peripheral speed of the capstan, the coarser the braid; inversely, the slower the pull-out, the tighter the braid. In event that a thread should break, the machine stops instantly, when the break is mended.

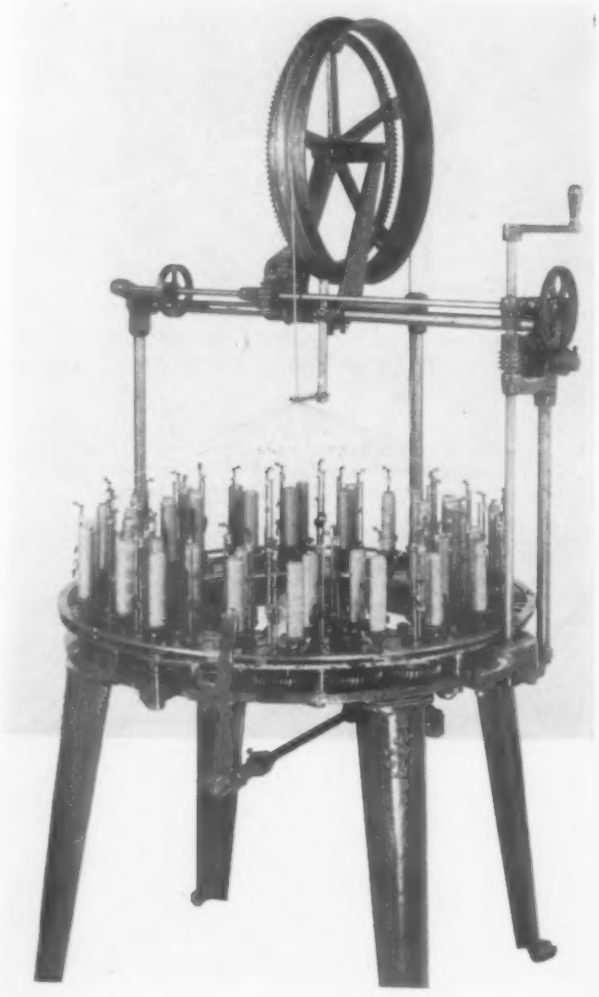
Both types of machines are of particularly ingenious design, and are also used in the textile industry for making tubular or flat shoestrings. And, they are as readily adaptable to the manufacture of flat tape or narrow fabric. Incidentally, they may be tiered or decked, one over the other, so that a layer of braid may be superimposed over another.

After braiding, the wire goes to the saturators, where it is impregnated with wax, asphalt or other compound. This holds especially for No. 14 wire, such as is commonly used in house wiring and which may be finished white or black, as desired.. The saturator is merely a long trough in which a screw or other agitator keeps the compound in motion, to prevent settling of solids. The wire is pulled through by a capstan and wound up on reels, with surplus compound removed by means of rag or rope wipers.

As an alternative, tracer covered wire, or primary wire —and even high tension—such as is used in automobile wiring, may be varnished or lacquered, when the original color of braid is retained. The operation is largely similar to saturating, described above. Varnished wire is run through troughs or tanks and either run through heated ducts or successively wound around a huge spider, for air drying. It is then wound up on reels, when it is ready for shipment.

On the other hand, lacquered cable is pulled through a receptacle containing the lacquer and sealed at both ends with a bushing that snugly fits the O.D. of the wire. This is to exclude air from the lacquer, so that it will remain fluid.

FIG. 3. Horn gear type braiding machine. Photo courtesy of New England Butt Company, Providence, R.I.



The lacquer coating is then dried by being passed, in several convolutions, through heated ducts. Spooled up, it is then ready for shipment, or, it may be armored, as described below.

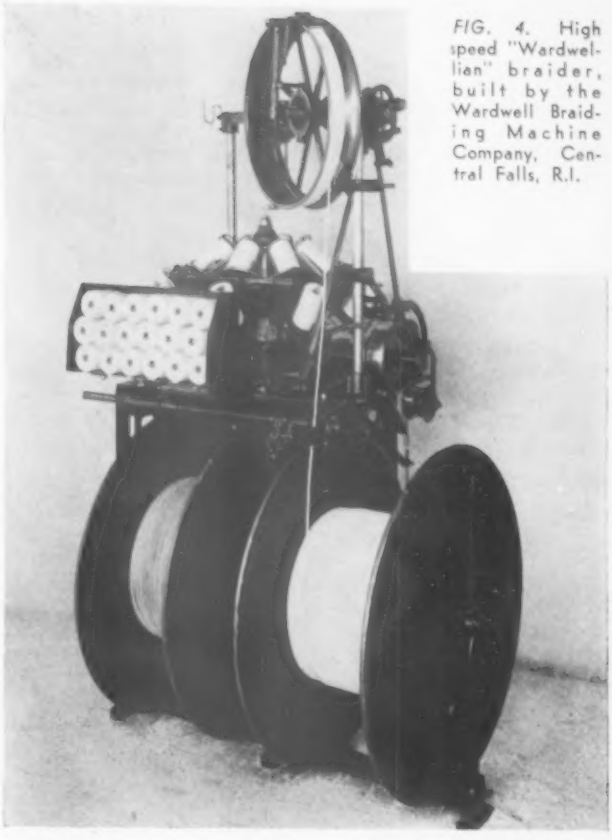


FIG. 4. High speed "Wardwellian" braider, built by the Wardwell Braiding Machine Company, Central Falls, R.I.

Flexible armored cable, such as is used in automobile wiring, is merely wrapped with galvanized, half round steel wire, the ratio of feed per revolution of flyer being the width of the armor. Incidentally, the flyers on armorers run at fairly high speed, and must be dynamically balanced. The armor is laid directly over the lacquered or varnished braid.

Saturated cable may be shipped as is, or, it may be further processed, as in the case of lead covered cable or parkway cable. Parkway cable is first saturated with asphalt, as described above and, while still hot, wound with jute, which is again saturated to "glue" it to the braid. It is then dual wrapped with steel tape, one tape being laid over the other. Another layer of jute is then laid over the steel covering, and also saturated. The purpose of the jute is twofold; to prevent rust, and to provide a soft cushion between the braid and the steel tape, and between the latter and the lead covering, which is the final stage in the manufacture of parkway cable.

Lead covering is an extrusion process, in which the cable is pulled through puddled or plastic lead and the O.D. sized by a die. This process, like rubber covering, was also fully described in article No. 1 of this series.

Heavier cable is shipped reeled, with lighter wire spooled or coiled. The coils may then be paper wrapped on an ingeniously designed machine that, in a few seconds, performs an operation that would be both laborious and time consuming if done by hand.

This concludes the series on wire manufacture. Starting with the October TOOL ENGINEER we will run a series on THE ELEMENTS OF GEARING.

By Anders Jansson

Gages and Inspection Systems

Precision gages, for control of Quality, have become "musts" in Mass Manufacture.

THE origin of measurement is shrouded in the mists of antiquity. We do not know who originated it, or who first used measures to check weights and dimensions. We do know, however, that systems of measurement were used in the Mesopotamian region at least 7,000 years ago, and that Hammurabi of Babylon had legalized a code of measures by the year 2100 B.C. Before him, however, the Egyptians had evolved systems, of remarkable exactitude, for superficial measurement and for orientation, and in the 10th century, B.C., Phoenician workmen built Solomon's temple to established standards. But then, Noah's ark (whenever or wherever its keel was laid) is said to have been built to specifications.

In the heyday of the Empire, Roman artisans used inside and outside calipers similar to the friction type today. And

Carl Edvard Johansson (1864-1943), originator of the famous Jo-Blocks and generally accredited as the "father" of the micro-inch, who developed measurement into an exact science. Photo by courtesy of Ford Motor Company, Dearborn, Mich.

if they had calipers, they must have had graduated rules by which to set them. From then on, however, development was slow and, with the exception of one or two rather remarkable advances, remained practically static until the end of the 18th century.

True, the English—and the American colonials—used "inches, feet and yards," but these were based on the bent thumb, length of pedal extremity or reach of some potentate —usually a king—and varied plus or minus with each succession. The result was a heterogeneity of "systems"—sans any standard—that finally evolved into the British Imperial standard yard. While the bar for the latter was cast by Troughton and Simms in 1844, it was not defined (by the Weights and Measures Act) until 1878, when it was decided that the yard should be the distance, at 62.00 degrees F.,

Because gages played such an important role in the late war, and as a consequence have been widely publicized, one might assume a general familiarity with the various systems now in use. Nevertheless, packed forums when gages are discussed, and recurrent demand for information on late developments, indicate a keen and unflagging interest. The more so, since *quality control* has become a "must" in mass manufacture.

Then, too, new systems are constantly coming to the fore, and lately, development has been so rapid that even veterans in the tool engineering field have been hard put to keep abreast of the latest. Hence, we are prompted to present this expositionary article on current Gages and Inspection Systems.

Nothing in this exposition, however, is to be construed as recommending any one device or product over another. Rather, the intent has been to "introduce" typical systems to our readers, without bias or favor. The descriptions, while necessarily brief, are correct in the belief of the writer, and to the best of his knowledge present the essential principles of the devices shown.

Ed.

"between two fine lines engraved on gold studs sunk in a bronze bar."

America adopted the English system of measurement, although there is a slight difference between the British and American yards—something like .00004 in one inch. Actually, there is neither scientific nor natural basis for the system. It could have been anything, as long as some one unit of length was agreed upon and legalized. Incidentally, the English system has not been legalized in the United States.

As early as the middle of the 17th century, however, a scientific approach toward a standard unit of length was proposed by the French astronomer Jean Picard. The proposal lay dormant until 1790, when the National Assembly (Fr.) appointed a committee to study the matter and to make recommendations as to the standard length of the meter. This was finally established as 1/10,000,000th of the quadrant of the earth on its meridian.

Louis Polk, president of the Sheffield Corporation, presents early models of Sheffield gages to the Smithsonian Institute. Center, Dr. Alexander Wetmore, secretary of the Institute, and right, Lt. Gen. L. H. Campbell, Jr., Chief of Army Ordnance.

Using round figures, and considering the circumference the earth as 25,000 miles, one-fourth of that would be 250 miles. 6,250 (miles) x 5,280 (ft.) x 12 inches would 396,000,000 which, divided by 10,000,000 would be 39.6″—ar enough, considering rough calculation, to the 39.37 inches the standard meter.

Since, however, the quadrant was the distance from the quator to the pole, (on the meridian of Paris) and the oles are slightly flattened, closer figuring would probably duce the meter to its accepted 39.37 inches. Considering at the system was established almost a century and a half o, the result is remarkably close.

As defined at present, however, there is no reference to ny natural basis or tangible constant, but to the wave length of the red light of a cadmium vapor lamp. Here, the relative accuracy of the value of the meter, in terms of light waves, is one part in 10 millions—or several times finer than the microinch! This does not mean that the original standard—one ten millionth part of the earth's quadrant—has been discarded, but that the basis can never be lost as long as light waves can be measured.

A Universal Standard

The foregoing brief history of measurement is pertinent to the topic since, without definite standards on which to base measurement, there could be no interchangeable manufacture. And without at least one universal and internationally accepted standard, as a basis for all systems, we could not possibly reconcile one system with another. The international standard is the meter and its decimal fractions or multiples, and the conversion constant is 25.4, with the decimal point moved according to the unit used. Thus, 1 (mm): 2.54 = .03937″; 10 mm (1 cm) = .3937″; 100 mm (1 dm) = 3.937″ and 1000 mm (1 meter) = 39.37″.

19th Century Brings Micrometer

Regardless of established systems, however, man had not arrived at any remarkable refinement, in measurement, until about the middle of the 19th century. True, in 1638 Wm. Gascoigne had invented a micrometer, consisting of two pointers with parallel straight edges, to be brought together or separated by a screw. This was used for astronomical purposes and had no particular value as far as superficial measurement was concerned. There was no standard on which to base linear measurement.

The real start, in gaging accuracy, was made by Sir Joseph Whitworth who, by 1841, had developed standard gages *for his own workshop*. About the same time, the Frenchman Palmer had invented a screw micrometer, based on the metric system, which was exhibited at the Paris Exposition in 1867 and subsequently brought to the United States by Jos. R. Brown and Lucian Sharpe. Modified to the English system, it was later produced by the Brown & Sharpe Mfg. Co., Providence, R.I., as a sheet metal gage.

FIG. 1. Precision gage blocks, product of DoAll Division, Continental Machines, Inc., Minneapolis. The set shown is metric.

This sheet metal (and wire) gage was gradually refined to the precision micrometer of today, of which the leading manufacturers are the Brown & Sharpe Mfg. Co., and the L. S. Starrett Co. of Athol, Mass.* However, other manufacturers now make these instruments, of which the limit of readable accuracy is .0001″, obtained by a vernier scale on the thimble.

FIG. 2. Granite surface plate, non-magnetic and non-warping, by the Herman Stone Company, Dayton, Ohio.

The vernier, invented by Pierre Vernier some time around 1610, made its debut in America (as a vernier caliper) about the same time as the micrometer and, successively refined, evolved into a gear tooth caliper and into depth and height gages in addition to its function as a caliper. Later, it was used as a micrometer scale on milling machines and jig borers. However, its ultimate reading was the split thousandth, and it can hardly be termed a precision instrument in the modern sense.

FIG. 3. Universal Checking Plate, by Master Industries, Inc., Indianapolis, Ind. Bench centers and angle plates are included.

Up to the beginning of the 20th century, however, these two instruments—the vernier reading to thousandths and the micrometer to tenths of thousandths of an inch—represented the ultimate in measuring refinement. Standard reference discs were used to set the micrometers, and while these were highly accurate and could be closely duplicated, there was no guarantee that a 1″ plug gage made in Rhode Island or Massachusetts would exactly coincide with a 1″ ring gage made in Michigan.

Exactness, in micrometer measurement, depended entirely on the "feel" of the user, and, even among the best tool and gage makers, there was sufficient difference in feel to make *strict interchangeability* a matter of luck rather than of certainty.

* Among other products, Brown & Sharpe Mfg Co. and the L. S. Starrett Company are also prominent in the fine gage and instrument field.

The foregoing is neither criticism nor disparagement of the micrometer as a precision gage, rather, its accuracy is compared (and perhaps unfairly) to a recent development—the microinch. The micrometer is indispensable to industry as the "universal" precision measuring instrument.

Also, at about the turn of the century, there was developed a measuring machine accurate to about one-fiftieth of a thousandth (.00005"); this however, was used for work beyond the range of the pocket micrometer and was mainly confined to the accurate checking of plug as well as linear gages. Coincidentally, there was a sharp upsurge in fixed limit snap gages, but these, too, were of questionable accuracy as compared to present standards. However responsible the manufacturer, or however careful the workman, gage making just hadn't developed into an exact science.

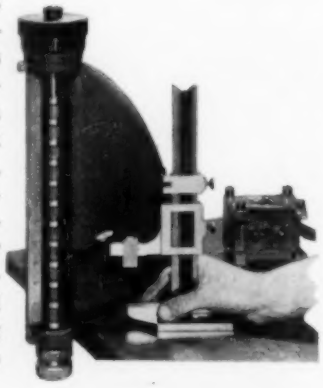


FIG. 4. Pla-Chek, a gage for surface plate work, by Cadillac Gage Company, Detroit.

In addition to the above measuring instruments, there were a number of amplification indicators based on the multiplying lever principle. The common lathe test indicator, in which a bar "wobbles" in a universal joint, is a good example. As another example, test instruments used in the electrical industry throw a beam of light across a room (or backward by means of mirrors), the amplification being then read on a large, remote scale. These, in time, evolved into the dial test indicators of which the B. C. Ames Company, of Waltham, Mass., is generally credited as the originator. In turn, these evolved into the highly accurate dial indicators and comparators which, today, are manufactured by Ames, Federal Products, Swedish Gage Co., Standard Gage Co. and other gage specialists. Several of these gages are pictorially portrayed in this exposition.

With certain reservations, the foregoing represents gage development up to the time of World War I, when American industry became sharply gage conscious. And, while gage development progressed apace, with accuracies far in excess of previous attainment, the measurement "revolution" was still to make its impact on America. The need was for a known quantity that would *stay put* and which would serve as a standard of comparison for all measurement.

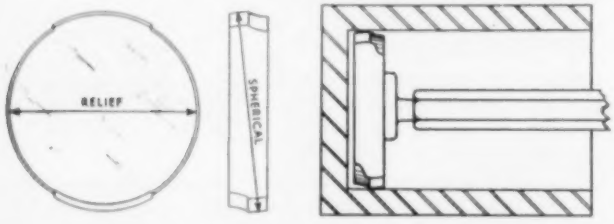
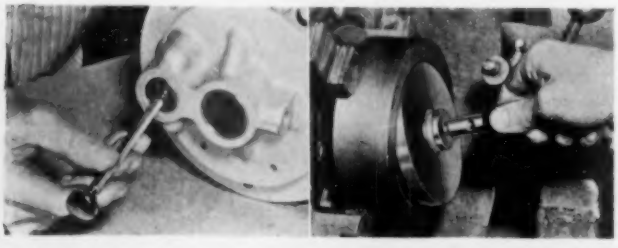


FIG. 5. DuBo fixed limit type plug gages, product of Standard Gage Company, Poughkeepsie, N.Y. Line drawing shows construction, with applications shown in photographs.



Measurement Revolution Starts

The revolution started in Sweden, where a young government arms inspector, Carl Edvard Johansson, had set himself to the painstaking and discouragingly tedious task of turning vision into reality. He proposed to produce a gage accurate to *one millionth of an inch*, and to so "fasten" this ultra-accuracy that it would remain permanent and be a standard for all measurement.

The problems confronting him were many and complicated. The steel used had to be recurrently chilled and heated, at seasonal ranges of temperature, until it had practically exhausted its tendency to expand and contract. Each gage, of the several that comprised a set, had not only to be ultra-accurate in itself, but so precise that when several—or even the entire set—were joined together, there would be no appreciable accumulative error. The surface had to be flat—as determined by the optical flat—and exactly parallel and of a finish far beyond any standard of the day.

After weary years of toiling in a home workshop, Johansson finally achieved the ideal, and the first complete set of Johansson Gage Blocks were produced in 1896. In the years following, a number of these sets reached America, where leading manufacturers of precision tools, gages and instruments used them as standards of comparison rather than as gages *per se*. In that capacity, they served as norms for many of the gages used in World War I.

The Jo Blocks developed, Johansson had then to persuade the industrial world to agree on two basic norms of measurement. There had to be both a standard temperature for precision measurement and a common ground for both the English and Metric systems of measurement. Temperature was finally established at 20 degrees Centigrade (metric) or 68 degrees Fahrenheit, and the ratio between the inch and the millimeter established as 25.4. For all practical purpose, this served instead of the precise figure of 25.4001 mm.

Jo-Blocks "Naturalized"

In 1923, Henry Ford acquired rights to manufacture the Johansson Gage Blocks in the Western Hemisphere, when Johansson came to Dearborn to take charge of their manufacture at the (then) newly organized Johansson Gage Division of the Ford Motor Company.* In time, other companies took up the manufacture of gage blocks patterned on the Johansson system, notably the Jansson Gage Company of Dearborn, Michigan, Webber Gage Company of Cleveland, and the DoAll division of Continental Machines, Inc., Minneapolis, Minn.

A set of DoAll blocks (metric) is shown in Fig. 1, and as these may be considered typical of the Johansson system, no other gages of this type are shown. It may, however, be accepted as a truism that Carl Edvard Johansson is the originator of the system—Jo Blocks, as they are familiarly known—and that all gages of this type are patterned on the original Johansson Gage Blocks. Johansson is also accredited with having "fathered" the microinch.

* The story of the evolution of the Jo blocks is interestingly told in Catalog No. 17, published by the Johansson Division of Ford Motor Company.

The value of this ultra-accurate gaging system was amply proven in the late war, when exactly comparable standards of measurement—in which the microinch was the accepted norm—insured absolute interchangeability of manufactured parts. Shells made in Delaware or Ohio would exactly fit guns produced in Michigan or New York, and so on through the entire gamut of Ordnance manufacture and other war production. Yet, dramatic as the role of gages in the winning of the war, it is expected that they will play an equally important part in the manufacture of consumer goods, now that peace is being reestablished.

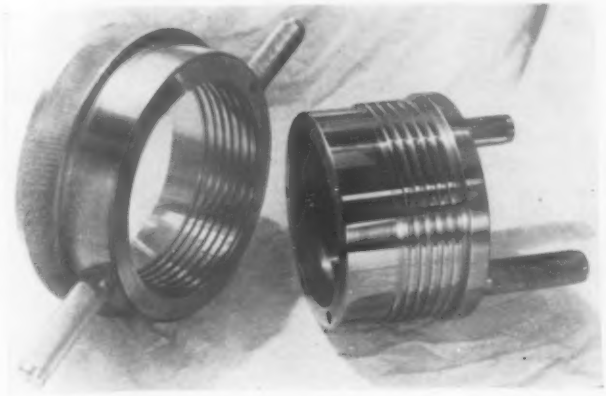


FIG. 6. **Thread gage as used for checking the modified Acme thread on the breach end of a 3" gun tube. Product of Pipe Machinery Company, Cleveland.**

Various types of gages are photographically shown in this exposition. It is not claimed that these cover the field, but that, with the exception of a few late entrants, they are typical of the gages and systems in current use. For example, such old stand-bys as plug and ring gages—familiar to almost everyone in industry—are not shown, although they are highly important as inspection tools. As for gages shown, description is boiled down to groups and individual captions.

Now, Granite Surface Plates

The surface plate has long been the "work table" of toolmakers and inspectors. Until recently, these have been made almost exclusively of cast iron, seasoned and machined, and then hand or machine scraped to surface flatness. Lately, however, there have been introduced surface plates made of granite, so precisely finished that makers claim them accurate to .0001". Aged through eons, there are no appreciable internal strains to induce warping; in addition, they are non-magnetic and, in view of this and the mirror surface finish, non abrasive. The granite surface plate, shown in Fig. 2, is made by the Herman Stone Company of Dayton, Ohio.

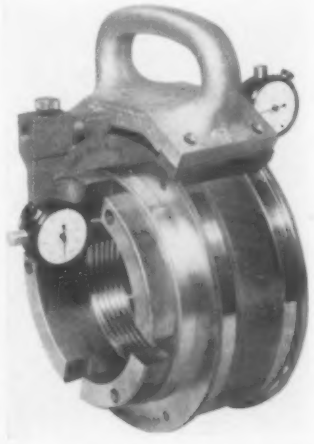


FIG. 7. **Gage used to check thread concentricity and stand-off of a 4½" Upset drill pipe tool joint, for petroleum industry. A Pipe Machinery Company product.**

A rather unusual development—a surface plate in combination with angle plates and bench centers—is the Universal Checking Plate shown in Fig. 3. This tool is a product of Master Industries, Inc., Indianapolis, Ind. Also, as an auxiliary to surface plate layout and inspection, is the Pla-Chek, manufactured by Cadillac Gage Company, Detroit This gage—Fig. 4—has twelve steps, spaced exactly one inch apart, and is said to be highly accurate for any size from .001" to 12" above the surface. Adjustment is by micrometer screw, with thimble graduated .0001".

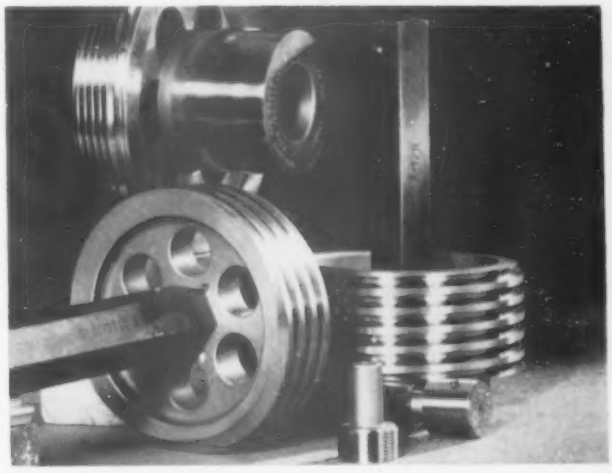


FIG. 8. **Typical precision thread gages (U.S.F. and modified Acme shown) made by Republic Gage Company, Detroit.**

FIG. 9. **Roll Thread snap gage, with base, for mass production checking of threaded parts. Product of Pratt & Whitney Division, West Hartford, Ct.**

As stated above, cylindrical (plug) gages are not included in this exposition; however, a refinement is shown in Fig. 5. This is a fixed limit type gage, called the DuBo, produced by Standard Gage Company of Poughkeepsie, N.Y., and used for checking bores. An unusual feature is the spherical shape and reliefs which actually permit entering bores smaller than the gage itself. Color signals—green for "Go" and red for "No Go"—enhance its use and, as seen by the photographs, holes are "accessible" from almost any reasonable angle of approach.

Heretofore, pipe threads have been considered in the "rough" class; we have been too wont to compare them with the work of the plumber and pipe fitter. With late rigid Ordnance specifications, however, and the need for absolute interchangeability in the field, the pipe thread has definitely moved into the precision class. This is not only true as regards Ordnance, but the petroleum industry, among others, has also come to specify precision standards in pipe threads. Shown in Figs. 6 and 7 are precision pipe thread gages made by Pipe Machinery Company, Cleveland, Ohio.

Fig. 8 shows part of a line of precision thread gages—Vee Thread (U.S.F.) and modified Acme—made by Republic Gage Company, Detroit. Shown on the gage, upper left, is a dust groove, considered essential to all working thread gages if not necessarily to checking gages. The function of these grooves is to clean out any small particles of dirt and chips that may remain in the thread, without damaging or further cutting the threads. Grooves should cut the root of the first thread and extend back for several threads, due to possible lead and angle errors that may be present in the part being checked.

An interesting "Roll Thread" snap gage, made by Pratt & Whitney Div., West Hartford, Ct., is shown in Fig. 9. This gage, mounted on a block, permits of quick and accurate checking of threads in quantity, the rolling action being very easy on the operator. Another P & W "roll" thread gage—a comparator—is shown in Fig. 10. This gage may be adjusted for varying diameters of screws by opening or closing the gap and interchanging the threaded rollers to the desired pitch. Reading is then direct on the dial indicator.

FIG. 10. **Pratt & Whitney roll thread Comparator, with pressure control. Gage is adjustable for diameter, and rolls are interchanged for various pitches.**

A gage of similar type is the "Limitrol"—Fig. 11—manufactured by the N. A. Woodworth Company, Detroit. This is a comparator gage which may be advantageously used for checking threads in the machine or on the bench, as desired, although both hand and bench models are offered. Not only may these gages be used for checking threads but, by changing the threaded rolls for plain ones, cylindrical parts—as wrist pins, for example—may be checked as well. Obviously, wear on the gaging surfaces of roll gages of this type is so slight as to be negligible.

FIG. 11. **The Limitrol, product of N. A. Woodworth Company, Detroit, for checking of threaded parts. Instrument may be adapted to plain cylindrical parts by substituting plain rollers.**

Coming now to dial indicators, these have been adapted to an almost infinite variety of uses. Mounted on suitable frames, they are used as inside and outside calipers, as dial micrometers, cylinder bore gages, test indicators for set-up, straightness, flatness and parallelism, and as comparators. Figs. 10 and 11 (above), are good examples of full dial and limited sector types adapted to thread gages. However, only a few examples of these gages are shown here.

Fig. 12 shows a base mounted, high precision, limited sector dial comparator—the B. C. Ames No. 26 Dial Comparator. As the name implies, this instrument is used for comparative measurement in which manufactured parts are checked against a master. Extremely close limits of tolerance are then indicated on the dial, the whole operation confined to a pass of the workpiece between the spindle of the dial and the anvil.

In Fig. 13 is shown a rather novel application, in which an Ames dial indicator is used, in the electronics industry, to indicate standard wave lengths. While delicate instruments, to be handled as such, indicators of this type are ingeniously designed to prevent injury to the mechanism. Stroke of spindle, of course, is limited, and a careless operator could ruin the instrument by jamming it against an obstruction. Within the limit of travel, however, the spindle usually "runs away" from the mechanism which, as a consequence, cannot go "solid" or jam internally

FIG. 12. **The new No. 26 Dial Comparator, product of B. C. Ames Company, Waltham, Mass.**

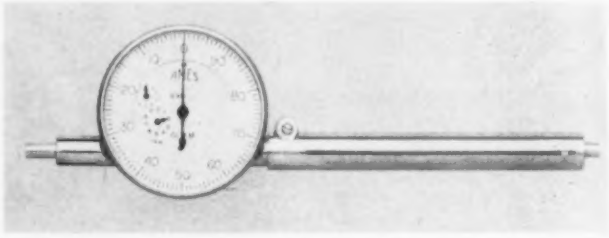


FIG. 13. **Special B. C. Ames dial gage used in the electronics industry to indicated standard wave lengths.**

In Fig. 14, is shown a Federal dial indicator, with cushioned movement, made by Federal Products Corporation of Providence, R.I. The function of the cushioned movement is to absorb shock resulting from careless handling or sharp blows, so that the force of impact is cushioned before it can be transmitted to the fine gear teeth, jewels, pivots or other delicate parts of the mechanism.

While this instrument is shown mounted for use as a depth gage, dial indicators are extremely versatile and have an infinite range of application. Combined with U frames, they may be used as micrometer calipers.

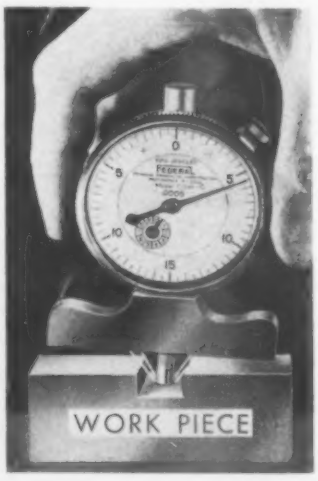


FIG. 14. **Federal Cushioned movement dial indicator, by Federal Products Corp., Providence, R.I. Shown mounted for use as a depth gage.**

Another gage of this type is shown in Fig. 15. This is the Mikrokator, by Swedish Gage Company, Detroit. This instrument has a rather novel amplifying mechanism, in that no gearing, levers, racks or friction bearings are employed. The pointer is mounted on a twisted strip of metal, twisted left hand on one side of the pointer, right hand on the other. The ends, in turn, are attached to an adjustable support and a spring "knee."

As the spindle moves upward, the vertical member of the spring "knee" moves and elongates the twisted strip, when the pointer rotates. The mechanism is protected from damage by shoulders in the spindle and body of the instrument. An internal indicator, for checking bores, is shown in Fig. 16. This gage is also a product of Swedish Gage Company, and is said to catch variations as slight as .00005".

Swedish Gage Company is also distributor for the Johansson Gage Blocks, manufactured by the Johansson Division of Ford Motor Company.

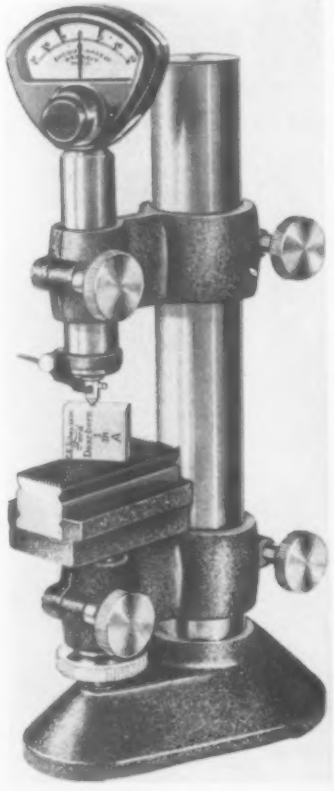
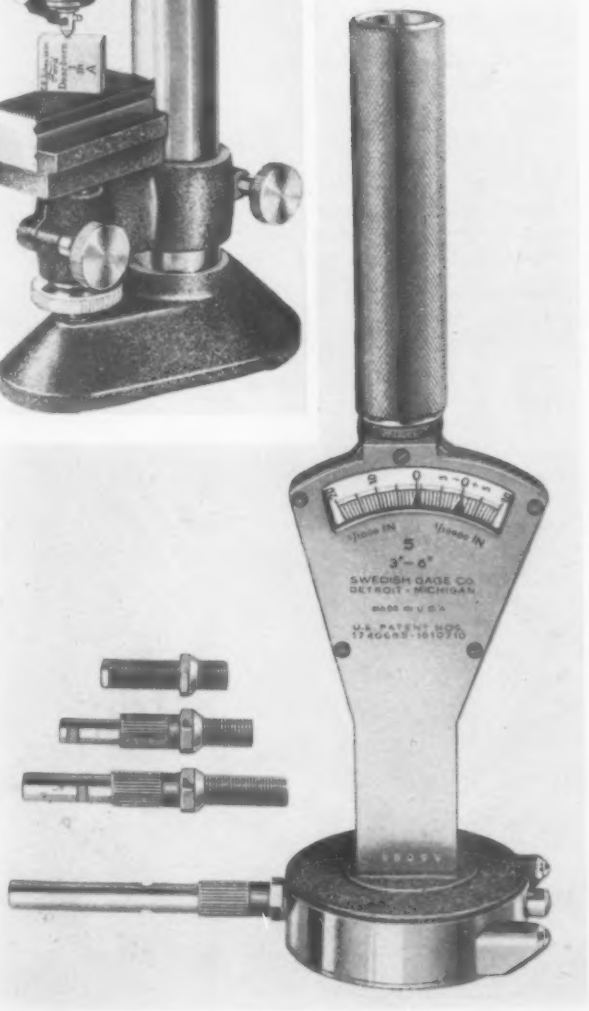


FIG. 15. The Mikrokator (left) by Swedish Gage Company, Detroit. High accuracy attained by novel, frictionless principle.

FIG. 16. Internal indicator, (below) with knife edge and lever amplifying mechanism, by Swedish Gage Company.



Another gage of this type—i.e., for checking bores—is shown in Fig. 17. This is a full dial bore gage made by Standard Gage Company, Poughkeepsie, N.Y. Fig. 18 shows another Standard Gage product—the Model 106 Comparator. Mounted on a table, this instrument permits checking of parts of considerable size, as may be judged by the ring gear shown on the table.

FIG. 17. Dial bore gage by Standard Gage Company, Poughkeepsie, N.Y.

FIG. 18. The Model 106 Comparator, by Standard Gage Company. Large table area permits checking of comparatively large parts.

Yet another gage of the type (dial) is shown in Fig. 19—the Comptorplug, made by the Comptor Company, Waltham, Mass. The instrument is provided with a shock absorbing movement.

FIG. 19. The Comptorplug, with shock absorbing movement, by the Comptor Company, Waltham, Mass.

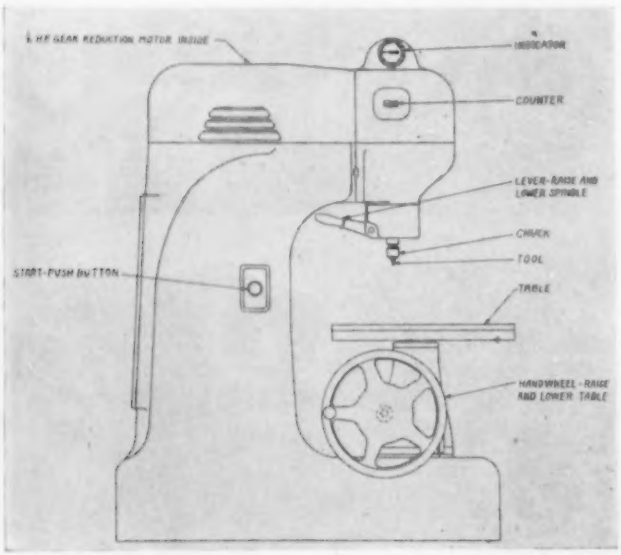
Of particularly novel application is the Hanchett Comparator (Podesta patent) shown in Figs. 20 and 21. This instrument is designed to accurately grade grinding wheels, hones and other abrasive material. In operation, a diamond—or special alloy grading tool—oscillates under a given load and gradually penetrates the grinding wheel or other material to be graded.

The number of oscillations is predetermined for each material, with wheels, hones, or other material, previously proven satisfactory, used as standards for comparison. The introduction of this comparator (shown in detail in Fig. 21) is particularly timely in view of present interest in surface finish. Similar grinding wheels and abrasives imply uniform

results, and by previous comparison, an absolute check is obtained without need to try out a wheel on the machine. This comparator is a product of Hanchett Manufacturing Company, Big Rapids, Mich.

FIG. 20. The Hanchett Comparator, for precise grading of grinding wheels, hones and other abrasives.

FIG. 21. Details of Hanchett Comparator, product of Hanchett Manufacturing Company, Big Rapids, Mich.



A recent development in contour comparators, incorporating the Sheffield Electrigage heads and produced by the Sheffield Corporation, Dayton, Ohio, is shown in Fig. 22. The gage shown checks barrel shaped bearing rollers for correctness of contour only, without any direct check on diameter.

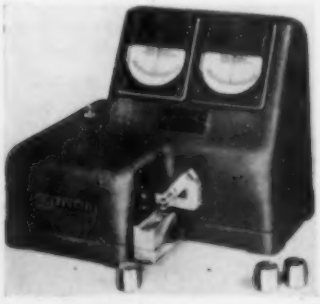


FIG. 22. Bearing contour comparator, with Electrigage heads, by the Sheffield Corporation, Dayton, Ohio.

As something "new under the sun," air operated gages provide unusually high amplification. Shown in Fig. 23 is the Precisionaire—also a Sheffield product which has amplification of 18,000 to 20,000 to 1. The model shown is a 5 tube design, the combination providing for checking, by one instrument, ten points along ½" diameter cylindrical parts

FIG. 23. The 5-tube Precisionaire, by the Sheffield Corporation. An air gage of very high amplification for ultra-precision checking.

In this category (air gages) is a new air-water gage, Fig. 24—known as the Federal Metricator System of Dimensional Gaging by Air. This gage, of which Federal Products Corp., Providence, R.I., are exclusive sales agents, is manufactured by Metrical Laboratories, Inc., Ann Arbor, Mich. The system consists of a graduated column and a gaging head, in which a manometer tube, built into the water column, indicates variations in the air pressure.

Gaging heads will ordinarily measure diameters from ½" up; however, holes as small as 5/32" can be gaged with reduced measuring orifices. Amplification is 4000 to 1 and measurements within .00025" are easily readable. The instrument may be used for direct measurement or as a comparator.

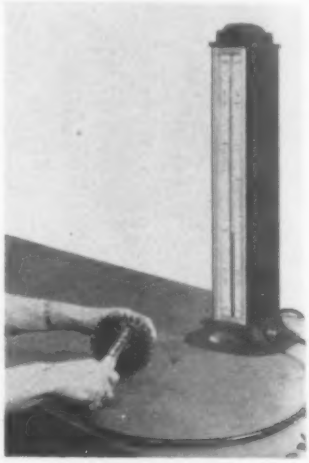


FIG. 24. High amplification air gage, made by Metrical Laboratories for Federal Products Corp., Providence, R.I. Precisely graduated scale permits direct measurement as well as comparison.

FIG. 25. Standard surface roughness specimens, by General Electric Company, Schenectady, N.Y. 10 specimens provide 25 standard surface comparisons.

With the sharp trend toward ultra-finish of surfaces, it would be surprising if someone hadn't developed comparison standards for control of surface quality. A set of standards, for this purpose, is produced by General Electric Company, Schenectady, N.Y., and shown in Fig. 25. Termed "Rough-ness Specimens," the set comprises 10 metal specimens which represent 25 sample standard surfaces. Practically running the gamut of surface finish, the purpose of the set is two-fold—to show comparative finishes and to enable operators to avoid unnecessarily smooth surface finishes.

Somewhat similar roughness standards (not illustrated) are made by the Surface Checking Gage Co., Hollywood, Cal. This set—called Surf-Chek—comprises 20 typical replica surfaces closely conforming with the N.A.S. (Nat'l. Aircraft St'ds.) 30 preferred values, and the specimen are prepared by machining, grinding, honing, lapping and polishing. With roughness (or finish, if you so prefer) standards, engineers and designers can specify quality according to known comparison standards.

In Fig. 26 is shown a Rough-Finish measuring head, product of the Brush Development Co., Cleveland. This is designed to meet the need for checking the rougher surface finishes and waviness in metals, glass, plastics, plated and painted materials. It measures irregularities, in surface finishes, from 100 to 3000 microinches, and thereby extends the range of the original Brush Surface Analyzer (of which it is a complement) from 1 to 3000 microinches.

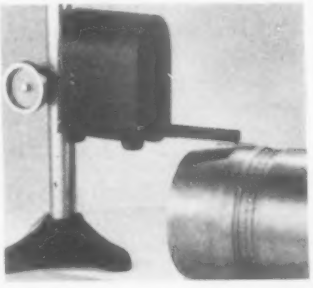


FIG. 26. Rough-Finish Measuring head, by Brush Development Co., Cleveland.

Microscope "Drafted"

Naturally, the microscope has been "drafted" into the ultra-surface finish field, and a number of microscopes have been especially developed for surface checking. Fig. 27 shows the Comparoscope, a product of the Compar-Instrument Co., Detroit. This operates on the unique principle of showing the comparative surface qualities of a test specimen and a workpiece side by side under the eyepiece. Round, rectangular, polygon or flat surfaces may be checked, any shape showing up as a flat surface. The coarser the surface, the brighter the object under the eye; inversely, the finer the finish, the blacker the field. Thereby, one has visual check, on quality, from comparative coarse to zero finish.

FIG. 27. The Comparascope, by Compar-Instrument Co., Detroit. Novel principle compares within one micro-inch.

Included among a number of optical gages, is the Polan Shop Microscope—Fig. 28—manufactured by the Zenith Optical Co., Polan Industries, Huntington, W. Va. This instrument may be equipped with recticles having special design for contour inspections or for measurement of specific tolerances on tools or parts. The standard recticle permits accurate measurement to .001" and measurements may be estimated to plus or minus .0002".

It may be of interest here, that screw thread comparator charts, for use with all optical projectors, optical comparators and shadowgraphs, are now available. These screw-thread Comparator Charts, by Engineers Specialties Division, with plants in Buffalo and Cleveland, can be supplied for practically all thread systems, especially for American National Coarse and Fine, and for British Standard Whitworth Threads. Magnifying a form many times, projection provides a visual check on threads and various contour forms.

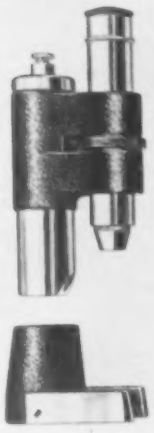
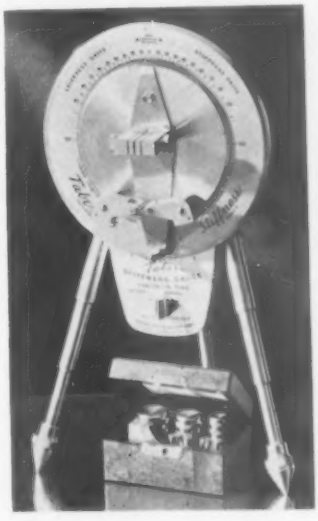


FIG. 28. The Polan Shop Microscope, by Zenith Optical Company, Polan Industries, Huntington, W. Va.



Among the new, for testing flexible materials, is the Taber V-5 power driven Stiffness Gage (Fig. 29), product of Taber Instrument Co., North Tonowanda, N.Y. This instrument is designed to determine standard measurements of the stiffness and resilient qualities of flexible materials—such as laminated plastic, cardboard, light metallic sheet and wire —up to ⅛" in thickness.

FIG. 29. Taber V-5 motor driven Stiffness Gage, by Tabor Instrument Corporation, North Tonowanda, N. Y.

FIG. 30. Fatigue Testing Machine by Southwark Div. of the Baldwin Locomotive Works.

Also, for testing similar materials, is the Baldwin-Southwark's Universal Testing Machine, Fig. 30. This is a product of the Southwark Div. of Baldwin Locomotive Works, and is designed for testing structural components and machine parts in both repeated bending and repeated torsion. Design permits any predetermined alternating load to be kept automatically constant regardless of changes in deflection that may occur in the specimen under test.

This machine will fatigue test plastics up to ½" thick, aluminum alloys up to 3/16" and steel of approximate ⅛" thickness. There is also ample space for testing of bulky assemblies, and the machine is easily adjusted for various specimen sizes. The machine is seismically suspended to eliminate vibration from the floor, and special fixtures may be accommodated by numerous tapped holes and T-slots in the platens.

FIG. 31. **The Densitometer, by Tripplet & Barton, Burbank. Cal.**

While not, at the moment, essentially adapted to the mechanical industries, a new recording Densitometer seems destined for broader application. Designed to detect variations in photographic or radiographic film, it will no doubt be used for the testing of plastics and similar transparent or translucent material.

The instrument—Fig. 31—was jointly designed and built by the Electrical Research Division of Western Electric Company and Leeds & Northrup Company to meet specification requirements developed by Triplett and Barton, Inc., Burbank, Cal., who is currently showing it. As used, an electrically operated apparatus automatically computes a true, logarithmic chart of its findings, completing in 30 seconds a permant curve that previously required a number of hand operations and involved risk of human error.

Of course, the gages shown here are but few out of many. So, for that matter are the manufacturers mentioned, among whom many—as Taft Peirce Mfg. Co. of Woonsocket, R.I.—have long been prominent in the manufacture of precision gages.*

The X-Ray and the "electric eye" have become important agents in inspection, as have such adamant, wear resisting materials as Norbide—by Norton Company—and tungsten carbide, produced by Carboloy Company, Kennametals, Firth-Sterling and Vascoloy-Ramet among others. At present stage of gage development, practically every element known to man, including light waves and electronics, is employed to attain ultra-precision.

Electronic Gages for the Blind

Is is entirely fitting, in concluding this exposition, that gages for use by the handicapped and blind should be included, the more so as electronic or electrically controlled, automatic gaging instruments will eventually have wider use in industry. In Figs. 32 and 33 are shown a new *electronic sound device*, developed by the engineers of Timken Roller Bearing Company, Dayton, Ohio, to permit blind employees—as disabled veterans—to overcome their handicaps and perform useful work.

In the photograph (Fig. 32) a blind employee—Sylvester Pfendler—of Timken is shown gaging the outside diameter of roller bearing cups by means of the instrument. And in Fig. 33, Helen Keller, *Pathfinder for those who travel in darkness*, "sees" the device and successfully demonstrates it. Of especial interest is that manufacturing details of the device, which will give employment to a host of blind veterans and civilians, will be released free of charge by the Timken Roller Bearing Company.

* Other gage manufacturers, with their products, are to be found in the advertising pages of this issue, *The Tool Engineer*. These include Acme Tool Company, Economy Tool & Machine Co., the Van Keuren Company and Wilson Mechanical Instrument Company.
Ed.

FIG. 32. **Electronic sound gaging device, for inspection, developed by the engineers of Timken Roller Bearing Company, Dayton, Ohio, for use by the blind.**

FIG. 33. **Miss Helen Keller, all time inspiration for the handicapped, "sees" the Timken electronic sound gaging device.**

By **Alfred R. Goatley**

Formula for Design of Cam Clamps

Mathematics for determining a mean average, between angular extremes, essential to secure clamping.

ONE of the most widely used work-holding devices is the cam clamp which applies the principle of the wedge to a rotating movement. Cam clamps may be designed quickly and accurately to meet specific requirements by applying two simple formulas that are given in this article.

The designer of a cam clamp must consider various factors such as: (1) the size or radius of the cam; (2) the amount of movement of the cam handle—or, as it is called—the angle of cam action; (3) the distance that the clamping surface moves, which is the cam rise and (4) the wedge angle. A cam clamp is actually a rotary wedge and the amount of wedge angle determines the degree of tightness of the clamping action. An angle larger than 7° produces loose clamping action and an angle of less than 3° will cause binding. A wedge angle of from 4° to 5° is considered a good average.

In the following analysis the mathematical relationship of these factors is shown:

Fig. 1 shows, in full heavy line, a cam of radius R where A is the center of the cam profile. The center of rotation of the cam is at H which is eccentric to A by a distance e. The cam bears against clamping surface S at point K. Now, rotate the cam clockwise through an angle Y. Point A will then move in a circular arc to a position A′ and point K will take up its new position K′. It will be observed that the point of contact of the cam and clamping surface S is no longer on the vertical centerline and that the clamping surface has been moved a distance T which is the cam rise.

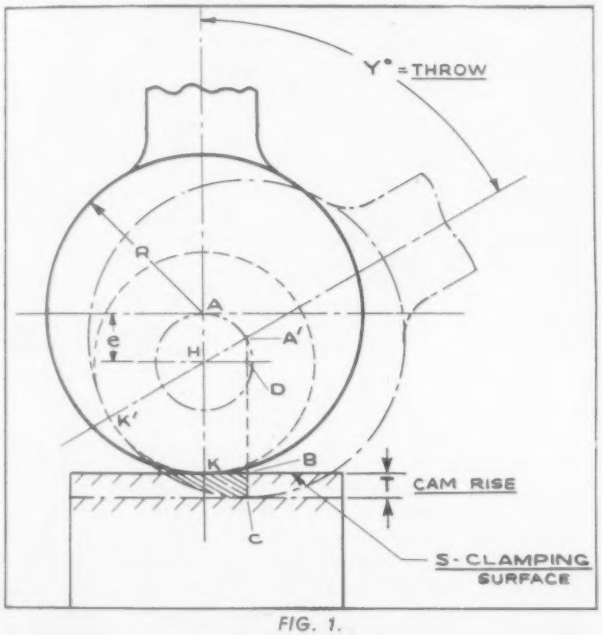


FIG. 1.

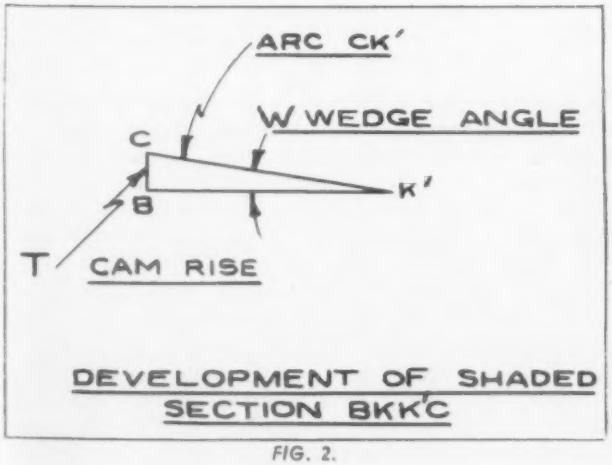


FIG. 2.

Alfred R. Goatley studied industrial and tool engineering at General Motors Institute, Flint, Michigan, graduating in '39. He is a member of Niagara District Chapter, A.S.T.E., and connected with McKinnon Industries, Ltd., St. Catharines, Ont., as Tool Engineer in charge of Transmission Tools.

As the cam is rotated the surface of the cam bound by arc CK′ will slide over the clamping face moving it a distance BC = T. If the curved tapered strip BKK′ C (shown shaded) were laid out, it would appear as a plain wedge as shown in Fig. 2, in which the hypotenuse is the arc CK′, the wedge rise is T and the wedge angle W degrees.

Then, $\sin W = \frac{T}{\text{arc } CK'} = \frac{T}{RY}$ where Y is in radians, $= \frac{57.3T}{RY}$ where Y is in degrees. Transposing, we get:

(1) $R = \frac{57.3T}{Y \sin W}$ where Y is in degrees. To find the eccentricity e, refer to Fig. 1, where T = BC = A′C − A′B = R − (A′D + DB) = R − (e cos Y + R − e) = e (1 − cos Y).

(2) Therefore $e = \frac{T}{1 - \cos Y}$

CAM NOMENCLATURE

R = radius of cam; e = eccentricity; T = rise of cam; Y = angle in degrees through which cam rotates to produce rise T; W = wedge angle (7° maximum—use smaller value for tight clamping).

HOW TO DESIGN A CAM

(1) Arbitrarily assign values to the angle of cam action Y, the cam rise T and the wedge angle W to meet the requirements of the design.

(2) Find the cam radius R from the equation $R = \frac{57.3T}{Y \sin W}$ where Y is expressed in degrees. If this value of R is too small or too large the wedge angle may be reduced or the angle of action changed.

(3) Find the eccentricity e from the equation

$$e = \frac{T}{1 - \cos Y}$$

EXAMPLE:—Design a cam to meet the following requirements: T = Cam rise = .12 inches. Y = Angle of cam action = 60°. W = Wedge angle = 4°. From equation (1):

$$R = \text{Cam radius} = \frac{57.3T}{Y \sin W} = \frac{57.3 \times .12}{60 \times .06976} = 1.64$$

From equation (2): $\text{Eccentricity } e = \frac{T}{1 - \cos Y} = \frac{.12}{.50} = .24$ inches

By Rex Heath

From Tool Making To Simplified Broaching

New approaches to old problems lead to a new line of light production machines.

The following article is an account of how a small shop, devoted to the manufacture of collets and collet chucks, not only licked a production job on small tools, but expanded it into the light machinery field. And, while the story may bring smiles to veterans in the broaching game, they will be smiles of sympathetic understanding as, in retrospect, they review their own "first hundred years."

For this story is typical of the start of many of our industries, each of which had to go through its growing pains before attaining maturity. It is also an example of Yankee ingenuity and of the will to win that has projected America into first place in world industry.

Ed.

THE term "Simplified Broaching" has no particular meaning since most broaching is comparatively simple—that is, to those familiar with the process. To the uninitiated, however, it may appear somewhat involved or mysterious because of the elaborateness of some of the equipment used. Be that as it may, it is hardly necessary to describe a process of which the principles, at least, are known to almost everyone engaged in metal processing. The rub, as will be shown, is the practical application of principles.

Zagar Tools, Inc., was practically forced into the broaching field by the urgency of war production, and by the lack of light, inexpensive broaching equipment peculiarly suited to its particular needs. For the past several years, the company has been manufacturing various types of collets and collet chucks. The collets, especially, have had to be manufactured on a production basis, in all sizes as well as in various hole shapes.

Necessity Mother of Invention

When it was first decided to make collets with square and hex holes, 3/16" to 1" across flats, the company was faced with several problems. Being a small concern, and venturing into a comparatively new field, it was felt that it could not afford the comparatively high prices asked for existing equipment. Another, and equally important consideration, was that there was not room for machines that might run 10 to 12 feet in length. For that matter, there seemed to be no particular need for strokes of 4 to 6 feet.

The deciding factor, however, was that machines were not immediately available, and urgency precluded waiting for future deliveries. Therefore, the company decided to make its own puller—or what later turned out to be a broaching machine.

As improvised, the first machine incorporated a welded steel tank with a 4" cylinder with 20" stroke. Conventional, commercial hydraulic units were employed, as a pump of 8 g.p.m. capacity, a 4-way valve and a pressure relief valve. Drive was by a 3 H.P. electric motor. In a comparatively short time, then, the company had a broaching machine suited to its needs and which, later refined and developed, evolved into a commercial product.

The next problem was to obtain broaches. Here the prices were reasonable—in many instances surprisingly low—and, ordinarily could be purchased from any of the reputable and experienced broach makers. There again, however, deliveries were far in the future. Everybody, it seems, had become broaching minded, and the broach makers, like the machine builders, were swamped with orders.

The only recourse, then, was for Zagar to make their own broaches, a venture embarked on with considerable trepidation and misgiving. Yet, as in all cases where people diverge into new lines, the result was not only recurrently new and interesting experiences, but new approaches to old problems.

The Zagars, father and son, were born in Europe, where the elder (Walter) served apprenticeship in a railroad shop. Coming to America, the family settled in Cleveland, where the elder was employed for 20 years, as toolmaker, with White Motor Company. The son, Frank, served his apprenticeship at White and, after studying mechanical engineering at Fenn College, spent some time in tool design.

Zagar, Inc., started a a home workshop in '37, and rapidly evolved into a growing industry as evidenced by the modern appliances shown in the photograph. Walter Zagar (left) is president, and Frank (right) vice president and general manager of the company.

With regard to the broaching machines, it happened that a number of customers for collets and collet fixtures saw the "trial horses," and were agreeably impressed by their apparent simplicity and equally apparent performance. The result was an order for several machines. These orders were filled, largely as an accommodation to friends.

The interest shown in these machines, however, and the evident satisfaction of the original purchasers, prompted the company to produce small, inexpensive pull and push broaching machines—Figs. 1 and 2—and to make these available to small shops. Designs were refined and manufacturing methods set up, and soon the company was manufacturing these machines on a production basis.

When it came to making broaches, a lot had to be learned. ... despite the prevalence of broaching, the average, skilled ...chanic, be he machinist or toolmaker, seems to know com...atively little about either the techniques of production or ... manufacture of the broaches. As a game, it seems to ...ve been reserved for the specialists.

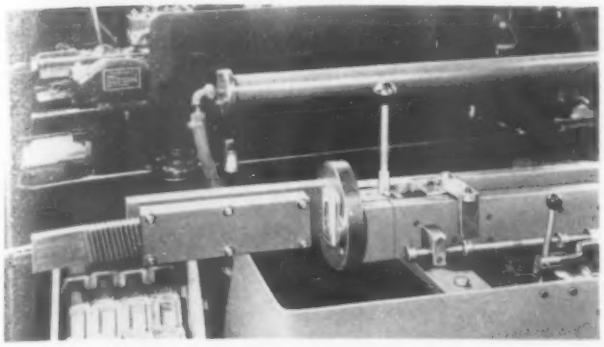


FIG. 1. Broaching a 1" x 2½" rectangular hole, ½" long, in a bronze shoe or a Zagar Horizontal Broaching machine. A special guide fixture insures dimensional tolerances between the hole and the outside of the casting.

As for that, it is a specialty, entailing not only a thorough knowledge of the machines, but of the numerous engineering and manufacturing problems involved in the manufacture of the broaches. The newcomer into the field has to acquire "Know-How" the hard way, and the novice—to use that term—approaches the problem cautiously. He is aware of his inexperience and, therefore, lacks the confidence of the specialist.

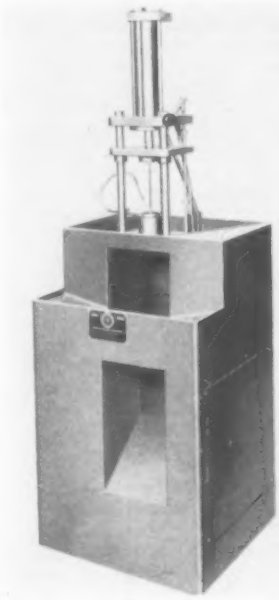


FIG. 2. 10" Zagar Vertical Broaching Machine. Of simple construction—it is built like a die set—the broach is pushed through by a 45° internal cone which mates with the head of the broach. With 1 ton pressure at 25 ft. per minute, and fast return stroke, a production of 200 pieces per hour is attained.

For one thing, there is a certain trial and error in the selection of steel, and in its subsequent machining, heat treating and finishing. There is also the fear that a broach will break, particularly in the first piece or the first few pieces broached. Or, it may last indefinitely, or until worn below the specified limits of tolerance. It's the uncertainty that worries the beginner.

One by one, however, these fears are vanquished. The problem of breakage can be solved by making broaching in pairs or, if the production is great and scheduled for several machines, in multiple. Then, if one broach should break there is at least one or more reserves with which to carry on until replacements can be made. Another reason for ordering two or more broaches is that several can be produced at lower costs, "per each," than if made singly.

To give an idea of comparative costs, a broach for a ¼" square hole will cost around $40.00 if produced singly, but only about $25.00 if made in pairs. An involute spline broach of approximately ⅞" O.D. and 15" long, on the cutting teeth, will cost $100.00 singly and $150.00 for two if ordered in pairs. These are today's prices.

Everything considered, broaches are quite inexpensive considering the amount of work they will do. For example, a hex broach ¾" across flats, 15" long, and pulled through a ¾" round hole, will broach a minimum of 20,000 pieces in mild steel and an unlimited number in brass or aluminum. Compared to other methods of machining, it can be readily seen that broaching is the least expensive process.

Practically any type of broach, with the exception of the involute spline, can be made with conventional equipment in the majority of tool rooms. The first consideration, in the making of broaches, is the type of equipment available for pulling the broach. The next consideration is the number of teeth and the spacing required for a particular job.

A Middle Way Between Extremes

At Zagar Tool, it has been found best to play safe and make the broach with as many teeth as possible consistent with the stroke of the machine and also within the reasonable limits of manufacturing a proportionately long, thin broach. In this connection, it may be recommended that small broaches as 3/16" or ¼" be left as short as possible in relation to diameter. For example, a good proportion for a ¼" broach would be about 10" along the teeth.

As aforesaid, these things were learned through experience. It has been found that, for broaching mild steel, .002 per tooth is practical, and that when broaching brass, bronze or aluminum, as much as .004 per tooth and even .005, .006 and .008 is possible, depending on conditions. However, it is good policy to play safe and to break up an operation between two broaches, taking off as little per tooth as possible. Yet, in broaching tool steel, there has been no particular difficulty in removing .001 per tooth.

The spacing of teeth is largely governed by the length of the hole. If, for example, a ½" hole is ½" long, a spacing of ¼" will be found ample. If the length is ¾" for the ½" hole, then the spacing should be 5/16", with an extra 1/16" in spacing for every additional ¼" of length. This is to provide ample room for chip curl and to prevent clogging, with consequent seizure and possible breakage.

Quick Action Broach Holders

The next consideration is as to how the broach is to be held in order to be pushed or pulled. Zagar simplified this by making a quick-action, threaded type broach holder, which makes it possible to thread the broaches a standard thread size and to insert them in a quick-action broach holder. These threads can be ground, after the broach is hardened, or, they can be chased while it is in a soft condition.

One advantage of grinding the threads is that, if the broach should snap off at the threaded section it is possible to regrind the hardened section. On the other hand, if the broach has an elongated slot through it, it is not possible to reslot without annealing. Sometimes it may be necessary to braze an extension to the broken part of the broach, and to slot the extension.

After a broach has once been designed, and length, diameter, and type of shank determined, it is ready for production. And here, it has been found practical to use Rex AA high speed steel, or its equivalent. In turning the broaches, it was only natural that Zagar should employ its specialty—collets. By turning in a collet, the broach is pulled out, tooth for tooth, as the work progresses. In this way, the broaches are machined very rapidly because there is no need of steady rests nor any worry about a thin long broach whipping over the top of the tool. By using collets, a broach 15" in length can be finish turned in about three hours time. The broach is then either rough or rough and finish milled for a form, or, it can be sent to heat treating in its rough condition, to be finished by grinding after hardening.

Broaches should be hardened by a competent tool steel hardener or, if sent out, by a reputable heat treating company. In either case, the proper facilities must be provided for handling long thin work, with furnace and bath temperature under perfect control. Equipment should include salt baths to prevent the excessive scaling that usually occurs in an open fire.

The hardener should also be thoroughly versed in straightening. As a matter of fact, broaches should be straightened immediately after the oil quench, before reaching room temperature. High speed slice, for instance, is not hard until it cools to room temperature, therefore, the broach must be handled when hot and straightened in that condition. An experienced hardener should straighten a broach within .005 on any part of its length.

The next operation is to lap centers and finish grind the broach. The round portion of the broach, and the round portion of the teeth, can be finish ground on any conventional tool room external grinder. Only the extreme outside should be ground, and not the chip clearance or the grooved diameters of the broach. These grooved diameters represent the thinnest part of the broach, and if they are ground first the broach will warp or go out of concentricity from .001 to .002 for every tooth. To finish circular grind a broach approximately 15″ long should take not over three to four hours.

Actually, an average mechanic should be able to completely machine a broach 15″ long inside of 12 hours maximum. After the round grinding, the broach should be put on a cutter or surface grinder for lengthwise or form grind.

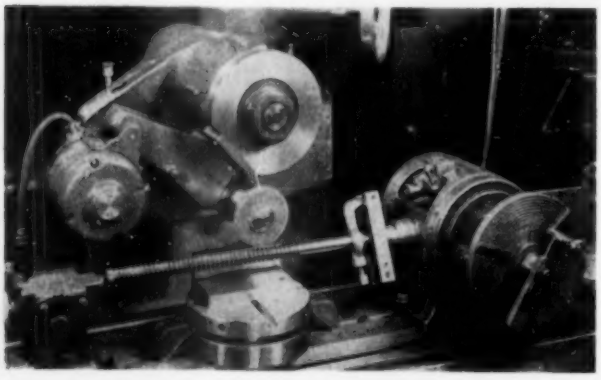


FIG. 3. **Spline or lengthwise grinding a broach on a B & S surface grinder with a Dumore attachment.**

Fig. 3 shows spline broach being ground on a No. 5 Brown & Sharpe surface grinder with a Dumore attachment. After spline or lengthwise grinding, the broach is ready for the grinding or sharpening of the tooth front, as in Fig. 4, which shows a broach being sharpened or face ground with standard tooling and attachments. Here a 10″ lathe and a Dumore grinding attachment are used for this grinding.

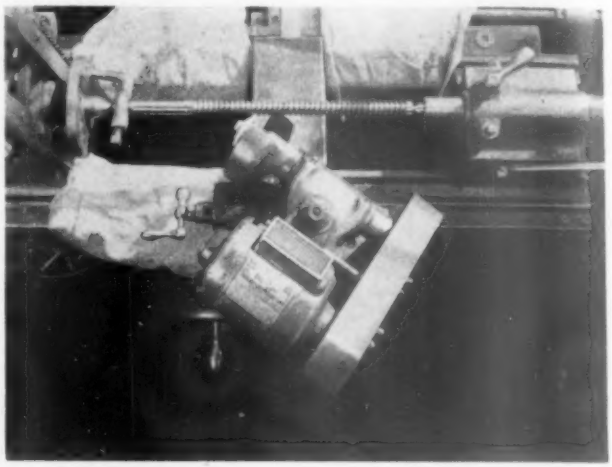
In sharpening the broach teeth, an important consideration is to "hook" the front of the tool and, also, to grind good radius or fillet. This radius is dressed into the grinding wheel and the hook is obtained by the diameter of the wheel and its relative angle to the broach itself. As small a wheel as may be practically used is recommended. On small, round broaches, for example—as ¼″—Zagar uses a wheel ½″ in diameter and set at approximately 30° with the axis of the broach. In this manner, a considerable hook was obtained.

It was found that the hook, together with the shape of the radius, is more important than the actual finish. In other words, if the front of the teeth were to be perfectly straight, and to have a high luster and a high finish and go down into a sharp corner, the broach would not operate nearly as successfully as it would with a 5° hook on the front of the tooth and a reasonable fillet or radius to curl the chips out.

In finish broaching round holes to .0005 tolerance—or closer—the size can sometimes be controlled by changing the front hook on the broach tooth.

The foregoing recommendations are Zagar's and, as aforesaid, they had to learn by experience although, from all indications and as an exception to the rule, experience has not been a particularly dear teacher. Rather, their experiences seem to have netted something new in the low priced broaching machine field along with well considered approaches to the manufacture of broaches.

FIG. 4. **Face grinding a broach, using a Dumore grinder mounted on a 10″ lathe.**



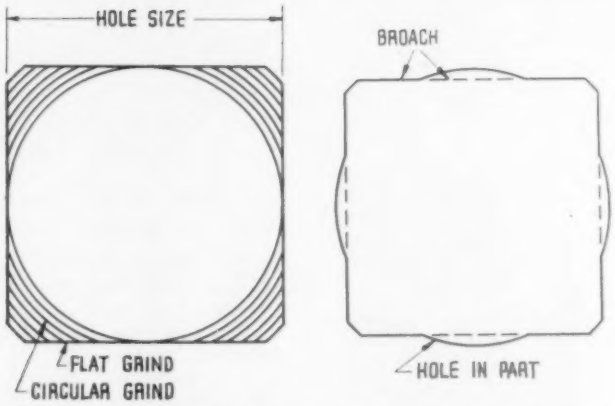


FIG. 5. **Square broaching starts from a round hole, progressively taking off more stock per tooth until desired shape is attained.**

One of the most frequent misconceptions, with regard to broaching, is the assumption that a square broach must start out with a small square and end up with a correspondingly larger one. The natural interference seems to be not one of developing a form, but one of progressively keeping the same form from a smaller to a larger size. The square broach is used as an example because it is the most readily visualized.

The proper way to make a square broach is to start from a round hole and to make the entire length the finished size of the square while progressively taking off more and more from a round hole to a square hole as is shown in Fig. 5. This development can be followed through for practically any type of form, as hex, spline, involute or what have you. This makes for easy manufacturing because the irregular contour is straight throughout the length of the broach, while the progressively diameters of the cutting teeth are produced entirely by a round or circular grinding process.

A.S.T.E. NEWS

NEWS OF INTEREST AND ABOUT MEMBERS

Semi-Annual Meeting . . October 12-13 . . Detroit

PLANS FOR THE 1945 SEMI-ANNUAL meeting of the Society have been altered to conform with prevailing conditions. Originally scheduled for Pittsburgh, by vote of the Board of Directors last October, the meeting is now slated for Detroit, October 12-13, through action of the Executive Committee, taken at its July meeting.

Travel restrictions still in force at that time, under the regulations of the Office of Defense Transportation, indicated the advisability of limiting the Fall meeting to a session of the Board of Directors and National Committee Chairmen, with a supplementary (necessarily small) membership meeting. Since the Victory over Japan, travel regulations have been eased somewhat, and the top limit on convention attendance has been increased to one hundred and fifty persons from outside the convention city.

It is felt that the importance of the problems to be discussed at the meeting will justify the sending of a representative from each Chapter. The newly-adopted ASTE Constitution, now in effect, will bring about many functional changes, some of which will become operative at the Semi-Annual Meeting next month.

Reports of the National Committees and their programs of future operation will be presented and considered. Among the newest of these, the Finance Committee will present a budget for the operation of the Society for the fiscal year, October, 1945, through September, 1946.

Having developed a complete standard for its own activities and those of Chapter Standards Committees, the National Standards Committee will review its accomplishments and present its suggestions for the production of valuable data sheets and their effective distribution.

Progress in developing the "Tool Engineer's Handbook," scheduled for release late in 1946, will be reported by the Handbook Committee. The National Education Committee will review the rapidly-progressing program being developed under its direction.

The Organization Progress Committee is expected to report at length, outlining the procedures already established for Chapter and National Committee operation, while the Constitution and By-Laws Committee will emphasize the new procedures which must be followed under the new Constitution.

Much interest will center in the report of the Editorial Committee which has been responsible for the management and production of *The Tool Engineer* since February of this year.

The National Program Committee, having produced many suggestions for the operation of Chapter Program Committees, an excellent list of technical speakers and visual aid equipment, is expected to report new progress in this field.

Unobtrusive in its activities, the Public Relations Committee has begun the co-ordination of the major efforts of ASTE to the end that the work of the Society and its accomplishments shall be clearly understood by its members, industry, and the public.

The work of the Membership Committee, always of prime importance to the Society, will likewise be reviewed.

At press time, headquarters for the Semi-Annual Meeting had not been determined, nor had the program been fully developed, but indications were that it would be a most interesting meeting and one vital to the future of the organization.

Complete details are to be forwarded to National Directors and Chapter Chairmen well in advance of the meeting.

Our New Constitution

A quick review of the Constitution of the American Society of Tool Engineers, adopted by vote of the membership and effective July 23, 1945, reveals an interesting series of changes and modifications in the basic law of the Society.

Two new types of membership will henceforth be available to applicants:

"An AFFILIATE MEMBER shall be a person, firm or corporation which at the time of application is actively engaged in the direction or supervision of industrial manufacturing. An affiliate member may appoint as a representative any person who can qualify as a Senior or Junior member."

"ASSOCIATE MEMBERS shall be persons who are engaged in industrial manufacturing and related industries in a responsible capacity, or who are so connected with the Tool Engineering field as to be competent to co-operate with Tool Engineers. No voting or ownership rights shall be allowed with this grade of membership."

In addition Life Membership has been officially recognized and the new Constitution provides:

"This Society shall have power to confer a LIFE MEMBERSHIP upon any member whom the members may deem worthy of such a high distinction, for services to the Society. No dues or fees shall be required from such Life Member and he shall be entitled to all the social and intellectual privileges of the Society. This grade carries all the privileges of Senior Membership."

Honorary Members and Life Members shall be elected by the House of Delegates at Annual Meetings of the Society. This action will be taken after the House of Delegates has received the opinion of the Board of Directors concerning the eligibility of the candidate.

Outstanding among the changes is the reduction of the number serving on the Board of Directors and the manner of their election:

"The BOARD OF DIRECTORS shall consist of eleven members, ten of whom shall be elected by the House of Delegates at the Annual Meeting of the Society in accordance with the provisions of the By-Laws."

(Continued on next page)

Featured in This Issue

Chapter	Page	Chapter	Page
At Large	54, 62	Phoenix	58
Boston	64	Pittsburgh	60
Chicago	63, 64	Racine	55
Cleveland	57, 61, 64	Springfield (Mass.)	50, 57
Dayton	51, 54, 58	(Springfield, Vt.) Twin States	58
Detroit	54, 55, 56, 60, 64	Toledo	56
Elmira	59	Toronto	50, 54
Fort Wayne	59	Wichita	58
Greater New York	54	Worcester	61
Hartford	57	Builders of ASTE	55
Kansas City	58	Film Flashes	61
Los Angeles	63	Obituaries	58
(Moline) Tri-Cities	63	Ten Years Ago In *The Tool Engineer*	63
(Newark) Nor. New Jersey	54, 60	The PX	54

"Tool Engineers' Handbook" 52, 53, 57

To be eligible for election to the directorate, it is no longer necessary that the candidate shall have served as a Chapter officer. The only requirement is that he be a Senior Member "in good standing for at least one year previous to his election."

Attention is drawn to the method of nominating candidates from whom the House of Delegates elects the Directors. This procedure is outlined in Division 1, Page 5, Lines 84-98, as follows:

"The ANNUAL NOMINATING COMMITTEE shall consist of not less than five Senior Members of the Society, nominated by the President, and elected by secret ballot of the Board of Directors in regular session at the Semi-Annual Meeting.

"Twenty or more Senior Members of the Society entitled to vote may constitute themselves a Special Nominating Committee, with the same power as the Annual Nominating Committee.

"The Annual Nominating Committee shall, through the Chapter Chairmen, at the January meeting of each Chapter, submit names and qualifications of all nominees for the National Board of Directors."

These are among the vital changes in the Constitution by which our future activities will be governed.

As a service to those of our members who in this period of reconversion may find themselves without employment, your Society offers a listing in the *Situations Wanted* page which will appear in the ASTE News Section in an early issue. In order to qualify for a listing, a member must give definite proof of unemployment.

Flynn Associate Editor *American Machinist*

New York—Harold L. Flynn, formerly Editor of *Machine Production* and *Canadian Plastics* magazines, of Toronto, Canada, recently joined the staff of *American Machinist* at the New York offices, as Associate Editor.

H. L. Flynn

Mr. Flynn, a native of Prince Edward Island, was educated in Nova Scotia where he attended St. Francis Xavier and Dalhousie Universities, studying both engineering and arts. Following this he spent about seven years in the newspaper business, subsequently becoming sales engineer for The A. R. Williams Machinery Company, Ltd., Montreal, Canada. From then until his recent association with *American Machinist*, Mr. Flynn had been editor of both *Machine Production* and *Canadian Plastics* magazines.

While in Montreal he actively assisted in establishing Montreal Chapter, ASTE, chartered in 1940, later transferring to Toronto Chapter where he served as Public Relations Chairman.

Knudsen Cited For Distinguished Engineering Makes Prophetic Challenge To ASTE

Detroit, Mich. — Recognized by a grateful government, for outstanding technical "know-how," a tool engineer has been awarded the coveted Distinguished Service Medal and Oak Leaf Cluster "For exceptionally meritorious and distinguished service to the Government in a duty of great responsibility."

William S. Knudsen

Most people think of Lieutenant General William S. Knudsen as the man who stepped out of the presidency of General Motors Corporation to take up the task of directing the War Department's mass production mobilization. Few know or remember him as the Danish-born, bicycle parts factory executive who grew up industrially with the automotive industry.

His patriotic contribution of production knowledge is summarized in the remainder of the Citation for Distinguished Service:

> "After distinguished service as a member of the Advisory Commission to the Council of National Defense and as Director of the Office of Production Management, General Knudsen was appointed Director of Production for the War Department on 28 January 1942. Since then he has served in that capacity and as a member of the War Production Board and the Aircraft Production Board. By his untiring energy, leadership, resourcefulness, foresight and thorough grasp of many difficult and novel problems of manufacturing weapons of modern design, he has contributed materially toward expediting the production of aircraft, guns, and other munitions. His vast knowledge of mass production, his unique talents and his broad practical experience have been placed at the call of all manufacturers, civil and military, and have aided immeasurably in the solution of their problems, hastening the flow of war material and supplies. In repeated tours to all industrial sections of the country he initiated, supervised and insured the completion of many programs for the expansion of industrial facilities essential to the war effort and for obtaining ever increasing production of munitions required by the Army and the Navy. His is an outstanding record of brilliant accomplishment."

An excerpt from the Citation for Oak Leaf Cluster to the medal makes another direct reference to his ability in the field of production engineering:

> "By the exercise of his unlimited fund of professional knowledge, plus his clear foresight and great executive ability, he has directed an amalgamation of the production development and design functions of the Army Air Forces with the agency of technical supply. His genius applied to these Air Force problems effected huge savings in manpower and money and has increased the agency of production of all aircraft technical equipment."

When "Bill" Knudsen recently returned to his adopted city, after nearly five years absence in Washington, Detroit turned out en masse to honor its famous son. Climaxing the parade, public and private receptions, and other honors was the tremendous ovation in the huge auditorium of Masonic Temple.

Visibly affected by this sincerely enthusiastic demonstration, the General modestly disclaimed credit for the astounding record made in producing vast quantities of war material, attributing it solely to the co-operative efforts of American industry.

Early in 1942, General Knudsen in a tribute and challenge to ASTE, said:

"The problem ahead of you is the Number One problem facing American industry today. It will require all the ingenuity, all the resourcefulness, all the initiative you have shown in the past. These qualities have made the American Society of Tool Engineers a key organization in American production. You know the job ahead of you. It is not for me to tell you how to do it. It is for all of us here in Washington to help you carry it out. You have my promise that we will do so. Every new machine tool you can save, every machine tool you can convert will mean extra power on the firing line. That is the power that will win."

His own mechanical bent was fostered in his early youth at the Danish government technical school in Copenhagen from which he graduated with honors, winning a silver watch and chain. After serving a four-year apprenticeship, he secured employment in a wholesale bicycle shop where he tinkered with machinery.

Coming to America at the turn of the century, his first job was in the Seabury shipyard at Morris Heights, New Jersey, working as a reamer on torpedo boats, followed by experience as a shop hand for the Erie Railroad. Then he joined the John R. Keim Mills in Buffalo, New York, makers of bicycle parts, eventually becoming assistant superintendent.

As the automobile began to supersede the bicycle, the plant went into the jobbing business, making parts for the new mechanically-propelled vehicles. Through handling Ford parts orders and the subsequent merging of the Keim Mills with the Ford Motor Company, Mr. Knudsen became associated with the latter organization, having charge of the company's 27 assembly plants in the United States. During and following the first world war he served the company in various production capacities in this country and in Europe.

His first connection with General Motors was in an advisory position. Advancements followed, up through the elected offices of the Chevrolet Company and General Motors Corporation. Shortly after he was made President of General Motors in 1937, he commented, *"I don't sit around and push buzzers. I have confidence in the men in charge of our operations."*

Mr. Knudsen is expected to return to his company in an advisory capacity, having been re-elected to the Board of Directors since his return to Detroit.

Annual Clambake At Springfield

Springfield, Mass.—Another of the annual clambakes for which Springfield Chapter is noted was successfully staged at Riverside Park in Agawam this summer.

A morning lunch staved off the pangs of hunger until the bake was opened in the late afternoon. The program included activities for all ages and interests, prizes being awarded to several of the 161 members and friends who were present.

Polk Presents Gage Models To Smithsonian

Dayton, Ohio—Four early models of gages and precision instruments that have revolutionized quality control of mass production have been presented to the Smithsonian Institution, Washington, D.C., by Louis Polk, President, The Sheffield Corporation, Dayton, Ohio. Dr. Alexander Wetmore, Secretary of the Smithsonian Institution, accepted the gages in a ceremony held in the Board of Regents room and witnessed by a small but distinguished group of government officials, high ranking Army and Navy officers, and industrial executives.

U.S. Gains Supremacy in Gages

In his remarks, Mr. Polk, a member of Dayton Chapter, ASTE, called attention to the importance of gages which, assuring efficient interchangeability of parts, have proved so vital in the war program. Wresting world leadership for the production of precision instruments from the once-famous Zeiss factory of Germany is a major accomplishment of American gage manufacturers. Fortunately, this leadership was secured before the outbreak of hostilities; otherwise, this country would have faced a tremendous handicap in the production of war materials in either the necessary quantity or quality.

Lieutenant General Levin H. Campbell, Jr., U.S. Army Chief of Ordnance, paid tribute to the tremendous job done by the Army Ordnance-Industry team in producing the vast quantities of materials required by the Armed Forces. He stated that the superiority of American weapons and equipment was due not only to their design and materials, but also to the remarkable accomplishment of American industry in the production of parts made with extreme accuracy, through precision work and dimensional control.

This made it possible to manufacture countless individual items in plants scattered over a wide area, and to assemble them at another factory. General Campbell warmly advocated and supported many improvements in materials and methods used in the production of Ordnance equipment, for which he has received national recognition.

One of the most interesting of the gages presented to the national museum is the first Sheffield shell Multichek, a multiple electric gage that checks a number of critical dimensions simultaneously. Tolerance is adjustable and is accurate within ten-millionths of an inch. It signals by a series of electric lights, all integrated into one master light. Individual lights show incorrect dimensions with red indicating undersize and green, oversize.

This particular instrument was installed at Frankford Arsenal in 1940 when General Campbell was the commandant there. From that time until the middle of 1944, it inspected 5,815,665 37mm. shells, a total of 29,078,325 dimensions, and saved more than 4,000 days of work over previous hand gaging methods. Approximately 122,000,000 37mm. shells have been manufactured since the beginning of the war, and most of them were inspected with multiple electric gages. Over one billion individual dimensions were checked, with a tremendous saving of work. These gages are also used to check a great variety of products in addition to shells.

Versatile and Accurate

Another gage in the collection is the first Precisionaire, used in a General Motors plant until recently. It is a flow type air gage for rapid and accurate measuring of internal diameter, bell mouth, out-of-round and average diameters, as well as outside diameters. The instrument has an almost unlimited range of applications, including the use of multiple tubes for inspecting several diameters simultaneously. Some current models are capable of checking tolerances to plus or minus five-millionths of an inch.

An early model Visual Gage is the first comparator using the frictionless reed mechanism and light beam lever arm to be made in the United States. It was used for many years at the Ford Motor Company in Detroit. Gages such as this are used for checking master and production gages, purchased parts, work in process and final inspection, for toolroom, laboratory and research work. Visual Gages range from 500 to 1 to 20,000 to 1 magnification, the latter model being graduated in units of two-millionths of an inch. If it were possible to split a human hair into 2,000 equal parts, this gage could accurately measure the diameter of one of the parts. It is so sensitive it will measure the expansion of metal when warmed by the touch of a human hand.

Checks by Colored Lights

The fourth gage in the group is an early model Electrichek, the first commercial comparator using electric signal lights. It shows by means of colored electric signal lights whether a dimension is within tolerance, oversize or undersize. This is an extremely rapid inspection instrument for production work, and it is accurate in checking either tolerance limit to within ten-millionths of an inch. The Smithsonian instrument was sold to Reo Motors in 1929 and remained in use there until recently.

A director of the Cincinnati Post of the Army Ordnance Association, ASTE'er Polk was recently awarded the Association's Gold Medal for outstanding service, as reported in an earlier issue of *ASTE News*. The presentation was made by the Association's President, Brigadier General Benedict H. Crowell.

Early models of gages and precision instruments that have revolutionized quality control of mass production are presented to the Smithsonian Institution by Louis Polk (extreme left). Participating in the ceremony are (left to right): Dr. Alexander Wetmore, Secretary of the Smithsonian; Maj. Gen. G. M. Barnes, Brig. Gen. H. F. Safford, Col. Harry B. Hambleton, Lt. Gen. L. H. Campbell, Jr. Chief of Army Ordnance; Capt S. D. Truesdell, Naval Gun Factory; Col. L. A. Codd, Executive Vice-Pres., Army Ordnance Association; and Maj. Gen. E. F. Harding. Mr. Polk, President of the Sheffield Corporation, Dayton, is a member of the ASTE Chapter in that city and of Cincinnati Post, Army Ordnance Association.

Handbook Described As "Place To Find Things You Forget"

ASTE's first "Tool Engineers' Handbook" is underway . . . it's past the preliminary stages of planning, compiling tables of contents, determining structure and format, inviting contributors and making assignments to those accepting . . . it's actually being written by authorities in their respective fields—men who will make it, in the words of Frank Martindell of the Handbook Committee, "the place to find the things you forget."

F. Martindell

F. W. Curtis

E. W. Ernst
Chairman

R. B. Douglas

A. L. Potter

Begun 3 Years Ago

In 1942 when the Standards Committee reported the need for a specific, tool engineering handbook—indicated in the many requests from members—serious thought was given to the publication of such a work. On their later recommendation, in 1943, that a special committee be set up to survey the situation, then-President Ray H. Morris appointed a Publications Committee composed of Standards Chairman E. W. Ernst, Past President Frank W. Curtis, Tool Engineering Literature Sub-Committee Chairman Frank Martindell, Montreal Chapter Chairman Robert B. Douglas, and Executive Secretary Adrian L. Potter. (Subsequently, when the Society assumed other publishing responsibilities, the name of this committee was changed to "Handbook Committee.")

Laying the groundwork by delving extensively into the contents of existing handbooks in related fields, sounding opinions and needs of hundreds of manufacturers, engineers, educators, societies, and other groups; collecting data, and weighing the relative qualifications of prospective contributors, the Committee gradually developed a conception of what the ideal tool engineering handbook should accomplish.

Editor Engaged

After interviewing many applicants, the Handbook Committee, with the the scrutiny and deliberation of every unanimous approval of the Executive Committee, engaged, as Editor-in-Chief of the projected Handbook, Frank W. Wilson, an industrial engineer whose broad experience as Copy Chief of the Catalog and Directory Division, McGraw-Hill Publishing Company, New York, made him the most logical candidate for the appointment.

Since assuming his duties at National Headquarters last January, Editor Wilson has worked out the detailed arrangement and contents of the book, submitted comprehensive progress reports to the Handbook Committee, assembled and indexed hundreds of bulletins, catalogs, and data sheets; located, and secured acceptance from outstanding editorial contributors.

Through the close co-operation of the Handbook Committee, constant revisions have been made—sections of the book being shifted about or merged, with much data expanded, contracted or deleted; each accepted contributor has had Handbook Committeeman—always with the goal of producing the best possible manual of tool engineering data.

With the outline completed, half of the detailed sectional synopses finished, authors invited and accepted for contributions approximating 45% of the estimated 1500 pages of text, and writing assignments in progress for about one-third of the book's contents, most of the sedulous, preliminary work is out of the way.

Contents Defined

As a yardstick in determining the types of data to be included or omitted, the Handbook Committee developed this concise definition to guide them in their selection of material: "All available, stable, authoritative data upon every phase of production planning, design, tooling, operations, control and inspection in which the Tool Engineer makes or influences a decision."

Some idea of the book's coverage and of the tremendous editorial job ahead, in attempting to meet a publication schedule prior to the 1946 Christmas gift season, is indicated in the following condensed and general listing of its highlights:

PRODUCTION PLANNING AND CONTROL—Product analysis; cost estimating; time study; job planning, routing, scheduling, dispatching; materials handling; small tools planning; reclamation and salvaging. Quality control; drafting room standards.

TOOL ENGINEERING ECONOMICS—Economic considerations in selecting equipment and methods; equipment operation, maintenance, depreciation, replacement; jigs, fixtures, dies, small tools; manufacturing lot sizes.

METALS AND ALLOYS—General structure and properties; theory of metal cutting; machinability; cutting fluids; plastic working properties.

PLASTICS AND OTHER MATERIALS OF PRODUCTION—General characteristics and properties of plastics, rubbers, woods, glass, etc.

SMELTER, MILL AND FOUNDRY PRACTICE—Brief details on metal melting, rolling, casting; plaster and "Lost Wax" casting; machine molding; die casting.

METAL FORMING OPERATIONS—Hot and cold pressworking; drop forging and hammering; swaging, upsetting; extrusion work; bending, rolling, spinning, etc.

PLASTICS FORMING OPERATIONS—Injection, compression and transfer molding; extruding; rolling, laminating, impregnating.

METAL TURNING OPERATIONS—Engine, turret and automatic lathe work; screw machines; planing, shaping, slotting; broaching; milling; drilling, boring, reaming; thread cutting, rolling, grinding;

Frank Wilson, Handbook Editor, checks "available, stable, authoritative data upon every phase of production . . . in which the Tool Engineer makes or influences a decision."

gear-cutting; shearing and punching; friction sawing; abrasive cutting; nibbling and routing; flame-cutting; production and toolroom grinding; honing, lapping, scraping, filing, buffing, polishing, superfinishing.

CLEANING AND PROTECTIVE FINISHING OF METALS—Wet, dry, abrasive, chemical, electrolytic cleaning; electroplating; metal and chemical process coatings; painting, enamelling, spray coating, etc.

MATERIAL AND PARTS JOINING—by welding, soldering, brazing; shrinks; by rivets, screws, bolts, keys, pins; stitching and stapling; plastic joining.

HEAT TREATING—All structure-changing and surface-hardening means and methods.

INSPECTION AND TESTING—Metal fits and tolerances; gaging systems, equipment and methods. Equipment and methods on specific tests: physical properties; threads, worms and ball-bearings; balancing, electrical, etc.

DESIGN—General product design; cutting tools; jigs and fixtures; punches and dies; master (project) tooling.

MACHINE ELEMENTS DESIGN AND STANDARDS—General design principles and selected approved standards for screw threads; gearing; tapers; spindles; arbors; dovetails; gibs; keys; pins; keyways; slots; journals, shafting, bearings; springs, etc.

POWER DISTRIBUTION AND UTILIZATION—Basic power formulas for steam, gas, Diesel, electric, hydraulic and pneumatic power; motors and controls, etc.

PLANT LAYOUT—Covering overall plant; drafting rooms; pattern shops; foundries; machine shops; pressrooms; tool rooms and cribs, etc.

MATHEMATICS, PHYSICS, TABLES, SYMBOLS—Shop mathematics; basic formulas and tables on trigonometry and other branches; essentials of physics and mechanics; tables of every useful nature.

Members to Contribute

Bringing the Handbook to satisfactory completion requires more than the labors of one editor, six committeemen and scores of writing contributors . . . it demands the active co-operation of each one of the Society's more than 18,000 members, chiefly in supplying data or suggesting sources of material.

Almost every member has his own private file of design and operating data assembled over the years—sketches of jigs, fixtures, dies and successful self-devised small tools; reprints of outstanding technical talks, unpublished manuscripts, tables detached from catalogs; graphs, drawings, diagrams and sheets from his or other companies' manuals of standards and practice—known to be the most advanced in accuracy and method of presentation, but never made publicly available.

Whatever has been helpful to him will undoubtedly have value for many of his Society confreres, plus the many more thousands in allied fields.

Editor Wilson appeals to each ASTE'er to take stock of his private or company data files, noting each item that he had hoped to find in a handbook . . . that presents useful and reliable data in handy tabular, graphic or pictorial form . . . that can stand the test of several years' worldwide use until the first Handbook revision . . . and, finally, to submit them immediately for consideration. Contributions or leads to sources of information should be addressed to Frank W. Wilson, Handbook Editor, American Society of Tool Engineers, 1666 Penobscot Building, Detroit 26, Michigan.

Recognition for accepted contributions will be given where required or desirable, and all material submitted will be returned, if requested.

Hundreds of manufacturers' catalogs and engineering data sheets—ceiling high—aid in the compilation of the Handbook. But, more are needed.

Handbooks, textbooks and standards manuals are used in the careful checking of material for inclusion in the "Tool Engineers' Handbook"—many more will be required before the handbook is brought to a satisfactory completion.

THE P X

512 E. Duke St.
Hugo, Oklahoma

Gentlemen:

I have received THE TOOL ENGINEER and the ASTE emblem both of which please me very much. The magazine enables me to keep abreast with new tooling methods, preparing myself for the post-war period.

Lt. Dykehouse

In addition to my duties as a Platoon Leader, I serve on a Battalion Instruction Committee in a Basic Training Battalion here at Camp Maxey. I've been in the service since July of last year and was commissioned early in June.

In civilian life I was an engineering student at The Plastics Industries Technical Institute of Los Angeles, working nights at Windham Bros. Company of Los Angeles, a plastic molding firm, where I had charge of the Tool Room and Mold Designing Departments.

Before going to Los Angeles, I worked for the Goodyear Tire & Rubber Company at Jackson, Michigan, having charge of the Rifling Department on the 3" M-7 cannon for the Army. This job covered the designing of all the rifling broaches, tools, gages, and machining for the rifling of the guns. Before we started production at the Jackson Goodyear Plant, I spent considerable time at the Arsenal in Watervliet, New York, learning their methods of gun making.

In peacetime, I hope to return to the plastics field.

Yours truly,
Lt. Robert H. Dykehouse
At Large Chapter

* * *

A.S.N. 36577133
43rd Bomb. Sqdn. 29th Bomb. Grp.
APO 246, Unit 2, % PM
San Francisco, California
Marianas

Dear Sirs:

Yesterday I received my TOOL ENGINEER. I'd like to compliment you on it. I believe it's our best so far. Your articles on "Tool Engineering Education" interest me particularly. I was just getting started as a Tool Designer for Triangle Engineering when I entered the Air Force. I had a year and a half on the board, and a few college credits from night school. I'd like to read more on the subject.

I'm looking forward to seeing the "Tool Engineers' Handbook" published.

Sincerely,
Sgt. C. J. Cubbin
At Large Chapter

* * *

Box 25, Naval Air Station
Navy No. 116, % FPO
New York, New York

Executive Secretary, ASTE

Dear Mr. Potter:

I would like to take this opportunity to sincerely thank both you and the Society for keeping me posted with THE TOOL ENGINEER and all pertinent literature of the ASTE.

I certainly miss good ole Detroit and my many friends there. If you ever have an opportunity, please remember me to Messrs. Zwolinski, Case and Megargle at Hudson Motors, Ray Hutton at Pioneer, and all my friends at the Engineering Society of Detroit.

In conclusion, I would like to recommend for membership, a naval officer whose address is enclosed. I suggest that all the necessary membership forms and pertinent literature be forwarded to him.

Sincerely yours,
Donald G. Groves, Lt. (jg) USNR
Detroit Chapter

* * *

S/Lt. H. Hoyer P.N.
% Polish Naval H/Q
51, New Cavendish St.
London, W.1., England

My dear Mr. Secretary,

Thank you very much for your so kind letter and the enclosed membership card. I would like you to know that I appreciate both the attitude and way you have chosen towards the members actually in the Armed Forces.

I feel certain, that due to your kindness, my links with the Society will become ever stronger despite my temporary professional inactivity.

It may be interesting to you or for the records of the Society, that since last October, I have been working in The National Physical Laboratory in Teddington, temporarily attached there for research work in metrology. The past year I have spent on a destroyer in the capacity of 2nd Engineer.

I wish you to carry on there, as till now, with your good work—I can assure you that we are also here doing our best.

Best of luck to you.

Sincerely yours,
Henry Hoyer
Toronto Chapter

* * *

317 E. Herman Ave.
Dayton 5, Ohio

Executive Secretary, ASTE

Dear Sir:

I was pleased to hear from you and to receive the membership card, which was forwarded to me here.

I have been sent here to learn to become a Topographical Computor at the Engineering School at Fort Belvoir, which I consider a very good break. My actually working into the Army as a Topo Computor will depend on the need of a man with my qualifications. Even if I don't get into that particular field, the education I will have received here will not be wasted.

I have had a review of Algebra, Math, Trig and Logs which I will use, once I get back into the field of designing tools.

This is the fifth week of my twelve weeks' training, following which I will return to Fort Lewis from whence I came. Right now we're in the midst of our second and last week of Astronomy. I find it hard to understand. Usually it takes a period of 6-9 months in any college, but here we're expected to acquire as much knowledge in just two weeks.

It was interesting to learn that Ohio State is considering the possibility of setting up a program for Tool Engineers.

Sincerely yours,
Pvt. Fred E. Titsch, Jr.
Dayton Chapter

* * *

A.S.N. 33942934
AT Co. 260th Inf.
APO 200, % Postmaster
New York, New York
Austria

Mr. H. Wilson Ryno, Secretary
Northern New Jersey Chapter, ASTE

Dear Sir:

You and the other members of ASTE may be interested in knowing that, with the ending of the war in Europe, I am lucky enough to still be one of the active members and not the "late" Mr. Landsidle.

It wasn't a picnic while it lasted, but Uncle Sam's Infantry was just too d... tough for these Heinies.

Germany and Austria are both beautiful countries. From the scenic standpoint there are very few places in the States to compare with them. And although there is not much left of the cities, there is evidence that at one time they were also beautiful.

The Germans seem to be more of an outdoors type than the Americans. Recreation and sports facilities in the cities are much more ample than our own—especially swimming pools and sport plazas. Maybe that's why these people all look so darn healthy. No doubt there is a lesson in this that could very well be copied by America.

We still have a big job to do over here keeping the people of the conquered and liberated countries away from each others' throats. But we will handle that as efficiently as we did the war. If the American soldier has his way, this time we shall win the peace as completely as we did the war.

Give my regards to all the members and tell them that I, in common with the rest of the boys, have one thing in mind —to get back to the good old U.S.A. and home.

Sincerely,
Pvt. C. A. Landsidle
Northern New Jersey
Chapter

* * *

A.S.N. 31187296
Hq. & Hq. Det. OSS, APO 627
% Postmaster
New York, New York
China

Gentlemen:

Having been in the Armed Forces, or a member of the Office of Strategic Service, since 1943, your monthly issues of THE TOOL ENGINEER have been forwarded from my home to my constantly changing Army address.

I cannot begin to praise the value and relaxation obtained from THE TOOL ENGINEER and periodic technical literature.

Hoping I remain a member in good standing, I am

Yours sincerely,
S/Sgt. J. Y. Boudreau
Greater New York Chapter

BUILDERS OF ASTE—*William H. Smila, President 1933-1934*

By O. B. Jones
Society Historian

"Bill" Smila's own account of what inspired while he was at the helm during the second year of the life of the ASTE constitutes this chapter of the series depicting the growth of our Society.

O. B. Jones

The growth of our Society is the growth of an idea. An idea packs a terrific wallop. One of them smashed an atom.

An atom may smash the earth unless some of us Tool Engineers get an idea of how to tool it up to do man's work.

The dynamic energy of the atom, pent up for aeons, cries out, "Give us the tools and we will finish the job."

"Bill's" narrative follows: "On March 16, 1933, the ASTE Board of Directors elected as President, W. H. Smila; First Vice President, Frank H. Hartlep; Second Vice President, T. B. Carpenter; Secretary, A. M. Sargent; and Treasurer, Joseph S. Slavik.

"In April, 1933, I appointed the following committee chairmen: Meetings, J. A. Siegel; Publication, O. B. Jones; Membership, Fred L. Hoffman; Constitution and By-Laws, T. B. Carpenter; and Standardization, Frank H. Hartlep.

"In addition to the above committees, I established two new committees and appointed as chairmen: Industrial Relations, Robert M. Lippard, and Junior Activities, Floyd Carlson.

"Upon taking office I felt that we should receive more publicity through the local newspapers and, therefore, appointed Lawrence Trebruggan as Press Agent for the Society.

"About this same time we received an invitation to become a part of the Associated Engineering Societies. There were mixed feelings on the part of our Directors concerning such a move, hence I appointed Messrs. J. A. Siegel and William J. Fors to act as a committee to investigate the possibilities and make recommendations as to whether we should join. The recommendation was not to accept the invitation, as it was felt we would lose our identity by such a move.

"However, within the past year or so the Detroit Chapter has affiliated with the Engineering Society of Detroit (an outgrowth of the Associated Engineering Societies) and in so doing has provided one of the finest meeting places that could be desired.

"Just prior to my taking office, we had the 'National Bank Holiday' and practically all of our funds (less than $200.00) were tied up. If I recall correctly, we had less than $10.00 in cash to operate the Society until such time as some of our bank funds could be released. This caused some 'expert maneuvering' on the part of the officers and Board of Directors, but we managed to come through without losing any great percentage of our membership.

W. H. Smila

"Our membership at the time I took office numbered about 750 members. This included our Junior membership. We reached this membership by conducting a membership drive while I was Chairman of the Membership Committee during Mr. Joseph Siegel's administration. Upon entering office as President, I set up a goal of 1,000 members. I am not certain whether we reached that goal, but if not, we came very close to it. On August 17, 1933, Mr. Fred L. Hoffman resigned as Chairman of the Membership Committee. I appointed Mr. William J. Fors to succeed him. Mr. Fors did an outstanding job in obtaining new members and in persuading many of our ex-members to re-join.

"The publishing of *The ASTE Journal* was no small task, and in the early summer of 1933, we hired Mr. J. J. Brown as Business Manager for the *Journal*. Whether he found the job 'too heavy,' or whether he received a better offer, is not known to us, but I do know that he resigned, thereby again throwing the weight of the publication back on the shoulders of the Publication Committee.

"During my administration we had many excellent meetings. At the October, 1933, meeting we had a subject entitled, 'Tools For Burglary.' This address was given by Dr. Henry L. Coles, Vice President of the Mosler Vault and Safe Company, and it is perhaps remembered by me more, due to its strange title, than for any other reason. On of the best meetings was the March, 1934, meeting, at which Mr. C. E. Johansson gave a talk on 'Precision Measurements.'

"At the first meeting during my administration (April, 1933) Mr. Harry C. Heffner was the principal speaker. As I had known Mr. Heffner since boyhood and knowing him to be an expert in the field of public speaking training, I conceived the idea of forming a 'Speakers Club,' having Mr. Heffner as our instructor. This club was formed and existed for several seasons, and many of our officers and members received valuable training during its existence.

"In June, 1933, we had our first annual field day. This was held at Belle Isle and a ball game between the Juniors and Seniors was one of the main events. I do not remember the final score, but I do recall that our genial Secretary, Al Sargent, tore his pants to the extent that he was practically playing in his B.V.D.'s.

"There were many other events, some amusing and some pathetic, which occurred during my administration, but these are the main ones as I recall them."

260 Attend Racine's Annual Frolic

Racine Chapter's Annual Frolic, recently held at the Meadowbrook Country Club, concluded the activities of a successful year. Among the sports and games enjoyed during the afternoon, golf was the most popular. Photo shows some of the 260 members and guests who gathered in the banquet hall for the dinner and social evening which followed the afternoon program.

Flanders Assists Nation In Solving Peacetime Industrial Problems
Noted ASTE'er Serves In Many Capacities

Springfield, Vt.—Ralph E. Flanders is a busy man—an exceedingly busy man—doubtless, one of the reasons leading high public officials and private industry to appoint him to posts vital in restoring the nation to a sound, peacetime economy.

R. E. Flanders

As Chairman of the Research Division of the Committee for Economic Development, Mr. Flanders "'heads the first important group representing general business (according to CED) to take a stand on the Bretton Woods proposals.'" While the Research Committee favors the International Bank for Reconstruction and Development, it "'urges the government to re-examine the possibility of strengthening the Bank in one significant respect before the adoption of the International Monetary Fund.'"

CED's efforts in developing an equitable tax plan, threshed out by Mr. Flanders' committee, were reported in the December, 1944, issue of *Fortune*.

To Develop Postwar Jobs

A non-profit organization representing private business, CED originated from former Commerce Secretary Jesse Jones' suggestion that a committee be organized to accept the responsibility for assisting commerce and industry to develop means for making their full contribution to stability and prosperity through the achievement of optimum employment and high productivity in the postwar period.

CED was delighted when Mr. Flanders, who "combines great vision with hard sense," consented to accept the chairmanship of the Research Committee, "concerned with the creation of an environment in the postwar period favorable to the expansion of enterprise."

On the occasion of ASTE's Eleventh Semi-Annual Meeting at Indianapolis in October of 1943, dynamic C. Scott Fletcher, Director of CED's Field Division, presented his organization's plans to prevent, upon the cessation of hostilities, "an industrial Pearl Harbor," urging the Society to rise to the challenge.

Operates Locally

The June-July, 1945, issue of *New England War Bulletin*, organ of The New England Council of which Mr. Flanders is a Past President, devoted two pages to testimonials from Chambers of Commerce in that area who find, to quote one Chamber Secretary, that CED, through the organization of local committees, "'stimulates, assists and reinforces its general work during this critical period of the world's history when free enterprise is on trial for its existence.'" Mr. Flanders has been active as a speaker in this connection.

Named to the Small Business Committee, the first committee appointed by Commerce Secretary Henry Wallace, Mr. Flanders, a Twin States Chapter ASTE'er, is the only New Englander so honored. This committee will offer suggestions as to how small business may do its full share in furnishing maximum peacetime employment. He serves also as Vice Chairman of the Business Advisory Council, Department of Commerce.

Other promotional projects commanding his interest include his chairmanship of the Massachusetts Committee for Port Development—created to bring about the improvement and enlarging of the Port of Boston which is closer to both northern Europe and South America than other Atlantic ports—and his membership in Governor Maurice J. Tobin's Special Commission Relative to Establishing a Massachusetts Department of Commerce.

Holds 3 Presidencies

His chief business activities are divided among his presidencies of Jones & Lamson Machine Company and Bryant Chucking Grinder Company of Springfield, Vermont, and of the Federal Reserve Bank of Boston. (In an extensive biographical article, August, 1945, *Fortune* related the importance that this bank has achieved under Mr. Flanders' direction.) He holds directorships in the Lovejoy Tool Company, Springfield, Vermont, and National Life Insurance Company of Vermont, is a trustee of Norwich University, a life member of the Corporation of Massachusetts Institute of Technology and an honorary member of M.I.T. Chapter, Tau Beta Pi.

A native of Barnet, Vermont, Mr. Flanders began his engineering career as a Machinist Apprentice and Draftsman at Brown & Sharpe, Providence, Rhode Island, later becoming a designer at International Paper Box Company, Nashua, New Hampshire, and an engineer at Fellows Gear Shaper Company, Springfield, Vermont.

For five years he was Associate Editor of *Machinery* magazine. An author of numerous technical papers and addresses, Mr. Flanders has written a number of books, including "Gear Cutting Machinery," "Taming Our Machines," "Platform For America," and "Toward Full Employment" of which he is co-author.

Receives Many Honors

In 1944, the Engineering Foundation awarded him the Hoover Medal for distinguished public service.

Honorary degrees conferred upon him by universities and colleges include the following: M.A., Dartmouth; M.E., Stevens Institute; D.Sc., Middlebury (Vt.) College, Rose Polytechnic Institute (Terre Haute, Ind.), Brooklyn Polytechnic Institute, University of Vermont, Norwich University and Northeastern University.

As a student of economics and an experienced industrial executive, he has served on numerous national industrial and research committees, such as the Machine Tool Co-ordinating Committee, one of the key units under the National Defense Council headed by William S. Knudsen; National Screw Thread Commission, Machine Tool Priorities, OPM, as Administrator; Social Science Research Council, and the Economic Stabilization Board.

He is also a Past President of the National Machine Tool Builders Association and of the American Society of Mechanical Engineers.

Despite his multitudinous activities, the busy industrialist finds time to enjoy his home, Smiley Manse, at Springfield, Vermont, pursuing, through the Bowman Orchard Company, his hobby of raising and breeding pigs. His herd numbered some 200 swine before the grain situation became critical.

Both Mr. Flanders and his wife have long listings in "Who's Who In America." Mrs. Flanders, daughter of James Hartness, famous mechanic, designer and inventor of earlier days, is well-known as an author, ballad collector, lecturer, and an authority on American folk-lore, particularly New England folk songs and ballads, having written several books on this subject.

Additional affiliations accredited to Mr. Flanders in "Who's Who" include the former Industrial Advisory Board of NRA, Advisory Board for the Subsistence Homestead Administration, American Engineering Council (former Vice-President), Academy of Political and Social Science, American Economic Association, Engineers' Club of New York, Algonquin, Union and Downtown Clubs of Boston.

"In recognition of their outstanding work in developing thread grinding machinery," he and his brother, Ernest B. Flanders, Past Chairman of Twin States Chapter and Thread Grinder Engineer at Jones & Lamson, were awarded jointly the Longstreth Medal, by Franklin Institute, Philadelphia.

Golf Tournament Features Toledo Outing

Toledo, Ohio—Tool Engineers in the Toledo area forsook their drawing boards for the course at the Highland Meadows Golf Club to take part in the Chapter's recent June Frolic.

The tournament opened at one o'clock and continued all afternoon. Approximately 85 members and guests participated in the blind par competition, with awards made for low net, low gross, and a surprise prize for the most strokes on any one hole. Some excellent scores were turned in, one member posting a 71 with no handicap, against a course par of 72.

Door prizes, including a War Bond, were drawn by 39 lucky members of the party.

Following the buffet supper, served to 161 men, a program of entertainment was presented under the direction of William R. Jay.

Grattan Sales Manager For Goddard

Detroit, Mich.—Stanley H. Grattan, Assistant Sales Manager, Goddard and Goddard Company, has been named General Sales Manager for the firm.

S. H. Grattan

Mr. Grattan has been connected with the milling cutter concern since 1919 when he was Chief Draftsman supervising design.

Affiliated with Detroit Chapter, ASTE, he has served as chairman of both the Membership and Constitution and By-Laws Committees.

Leading Engineering Executives Accept Handbook Assignments

EFFORTS OF THE HANDBOOK Committee and of Editor Frank W. Wilson in securing, from outstanding authorities in industry, editorial contributions to the "Tool Engineers' Handbook" have met with encouraging success. Included among the first to accept writing assignments for the new manual are the following:

ELMER J. BRYANT, Director of Research, Greenfield Tap and Die Corporation, Greenfield, Massachusetts. In his long association with the Greenfield concern, begun in 1923, Mr. Bryant has served successively as Gage Department Manager, Western District Manager, and Chief Engineer, Gage Division, prior to being appointed to his present position in 1944.

E. J. Bryant

Throughout World War II, he actively assisted the War Department as Expert Consultant to the Secretary of War, Principal Engineer in Office of the Secretary of War; Chairman, American War Standards Committee on Screw Threads; and Chairman, Joint United States-Canadian Screw Thread Mission to London.

As a Major in the Ordnance Department Reserve, he was assigned to Manufacturing Service, Executive Section of Washington, for a ten-year period terminating in March of 1935.

An author of technical papers and trade magazine articles, Mr. Bryant has been granted several patents on small tools and gages.

Affiliated with Springfield (Mass.) Chapter, ASTE, he is also a member of ASME, SAE, Interdepartmental Screw Thread Committee, and (Chairman) ASA Sectional Committee on Standardization and Unification of Screw Threads.

After completing his apprenticeship at Brown & Sharpe Mfg. Company, Providence, Rhode Island, and postgraduate studies at Mechanics Arts School, Boston, Mr. Bryant became General Foreman of the Small Tool Department at Brown & Sharpe, continuing in this position until accepting the managership of the Small Tool Division of Taft-Peirce Mfg. Company in Woonsocket, Rhode Island.

* * *

As a high school youth, RICHARD A. SMITH, Chief Tool Engineer, Pratt & Whitney, Division of Niles-Bement-Pond Company, West Hartford, Connecticut, became interested in engineering through association with a Marlboro, Massachusetts, inventor named Koehler, making drawings and parts for several of the latter's developments, including a miner's safety lamp closed by magnetism.

R. A. Smith

Following his engineering studies at Tufts University during Army service in World War I and the completion of an ICS course in mechanical engineering, he entered the employ of La Pointe Machine Tool Company, Hudson, Massachusetts. Subsequent connections with Greenfield Tap and Die Corporation, Greenfield, Massachusetts; Winchester Repeating Arms Company, New Haven; Babcock Printing Press Mfg. Company, New London, Connecticut; and National Acme Company, Windsor, Vermont, led up to his association with Pratt & Whitney.

Long-interested in engineering education, Mr. Smith has served, since 1936, on the faculty of the night school branch of Hillyer Junior College, teaching machine design, tool design, and tool engineering. In addition to writing a treatise on Hydraulics in Machine Design, and giving the course, he assisted in laying out a full course in tool engineering offered by this school.

His teaching activities have embraced also instruction in shop practice for Colt's Patent Fire Arms employees, and lectures on hydraulics at meetings of technical organizations.

Instrumental in the founding of Hartford Chapter, ASTE, of which he is a charter member, he has held several Chapter offices and is now acting as Second Vice Chairman.

* * *

JOSEPH I. KARASH, Plant Engineer, The Reliance Electric & Engineering Company, Cleveland, Ohio, has devoted his 15 years of industrial experience to service in various departments of the Reliance firm.

J. I. Karash

Well-known as a writer of technical articles appearing in leading trade publications, he is the author of a new book, "Analysis of Drill Jig Design," presenting a new concept of the mental processes of tool design.

His papers on tool and die subjects include an address on "Die Design For Safety," delivered before a convention of the National Safety Council.

Prior to his association with the Reliance company, Mr. Karash completed extensive courses in tool engineering and metallography at Fenn College, and a course in time study at John Huntington Polytechnic Institute.

A member of Cleveland Engineering Society, he is now Chairman of Cleveland Chapter, ASTE, after holding several other Chapter offices.

* * *

HERMAN F. ZORN, President and General Manager of The V & O Press Company, Inc., Hudson, New York, began his career as an apprentice tool and die maker at the old-established New England firm of E. Ingraham Clock Company, Bristol, Connecticut.

H. F. Zorn

Following his apprenticeship, augmented with special courses and special training in engineering, he was connected with the New Departure Manufacturing Company of Bristol, and the Corbin Cabinet Lock Company of New Britain, Connecticut. During the first world war, he accepted a position with Watervliet Arsenal at Watervliet, New York.

In 1923, Mr. Zorn joined the V & O Press Company as an inspector, subsequently becoming Shop Superintendent, Sales Engineer, Sales Manager and Vice President before his election to the presidency last year.

Over a period of years, he has given many addresses before various technical organizations, particularly ASTE, and has written numerous articles relative to press work, for publication in trade magazines.

* * *

HAROLD C. R. CARLSON, Chief Engineer, Lee Spring Company, Brooklyn, New York, has been active in the design and application of mechanical springs for over 15 years.

H. C. R. Carlson

A former design engineer for the Otis Elevator Company for nearly 12 years, he assisted in the designing of hoisting equipment and other special apparatus used in the Empire State Building, Chrysler Building and many other prominent buildings. Here he had ample opportunity to work on the design of spring-actuated devices and electrical and mechanical parts incorporating the use of springs.

Observing that few engineers were willing to delve into the more complicate spring problems, he was prompted to study thoroughly this little-known subject of machine design, making this phase of engineering his specialized work. Since 1940, he has been associated with the Lee Company, being on call for consultation by manufacturers, the Army, Navy, and governmental agencies.

He has conducted innumerable research and experimental tests and is the author of a number of technical articles.

A native of Massachusetts, he was graduated from a technical school in that state, a naval school in Virginia, and from Pratt Institute in Brooklyn, completing additional courses at the Polytechnic Institute of Brooklyn, Columbia University in New York, and others.

For many years, Mr. Carlson has been active in the Metropolitan Section of ASME, serving in various offices. He has been Chairman of the Engineering Societies Committee on War Production of New York City since 1943, and is a member of the New York District Committee of the American Society for Testing Materials. A director of the Fort Green Industrial Health Committee, he is keenly interested in industrial relations and industrial management, believing that engineers should be more prominent in these fields.

* * *

Other authoritative editorial contributors who will assist in the preparation of the "Tool Engineers' Handbook," will be introduced through the columns of *ASTE News* from time to time.

OBITUARIES

Pte. John Caullay

Word has been received of the death of Pte. John Caullay, of Windsor (Ontario) Chapter, who passed away April 8 of wounds inflicted earlier in Italy. Had he lived until June 15, Pte. Caullay would have reached his twenty-second birthday.

John Caullay

Born in Kirkintilloch, Scotland, he passed his childhood and youth in Windsor and Walkerville, Ontario. For many years he was a boy scout, being a King's Scout in 1939 when King George and Queen Elizabeth visited Windsor. A memorial service, attended by approximately 400 friends of the deceased, was held at Chalmers United Church, Windsor, where he was leader of the 22nd Chalmers Scout Troop.

Pte. Caullay was educated at Windsor Vocational School, and Cass Technical High School in Detroit, prior to his employment as tool designer at Colonial Tool Company, Windsor.

A member of the famed Essex Scottish (Reserve) Regiment, he enlisted for active service in September of 1943 and was re-assigned. He received his recruit and advanced training at Chatham and Ippewash, Ontario, respectively. Chosen as an instructor and promoted to sergeant, he had further intensive instructors' courses at Ottawa and Long Branch where he topped the special school with a grade of 96%.

Still motivated by a desire for action, he relinquished his rank and went overseas in September of 1944. After serving in England for a few weeks, he proceeded to Italy to join the Seaforth Highlanders of Canada, where he was engaged in combat duty until March of this year. Transferring to the Netherlands, he subsequently succumbed to his wounds and was buried near Nijmegen in that country.

* * *

Virgil G. Chappie

Previously reported as missing in action, Staff Sergeant Virgil G. Chappie, 21, has been listed among those killed in action. The Flying Fortress on which he was an Aerial Gunner was shot down during a mission over Germany last year. Sergeant Chappie was earlier awarded the Air Medal for Meritorious Service in Combat.

Mr. Chappie was born in Dayton, Ohio, where he spent his entire life, prior to entering the service in 1942. A member of Dayton Chapter, he was employed at The Sheffield Corporation in that city.

Murray S. Griffith

Murray S. Griffith, 39, Chief Designer, Reed Roller Bit Company, Houston, recently passed away at the Goose Creek Hospital, Goose Creek, Texas.

M. S. Griffith

Born in Honey Grove, Texas, Mr. Griffith had resided in Houston since 1939 when he joined the Reed company as draftsman. Previously he had been associated with the Continental Gin Company of Dallas, designing cotton ginning machinery. He was educated at North Texas State Agricultural College in Arlington.

A charter member of Houston Chapter, ASTE, he had served two terms on the Membership Committee, acting as Membership Chairman last year. Mr. Griffith was also affiliated with Eastgate Lodge, No. 1153, A.F.&A.M. in Houston.

ASTE—Recognition—Or?

Editor's Note: The following is quoted from an editorial written by Boyd A. Christensen, General Foreman, Fabrication Tool Engineering for Boeing Airplane Company at Wichita. A member of Wichita Chapter, ASTE, Mr. Christensen in contributing the editorial was serving as Guest Editor in the preparation of the Wichita Chapter's announcement of its July meeting program.

The quotations from the editorial are re-printed with Mr. Christensen's permission. He points out that ASTE is a "young engineering society." He calls attention to the fact that many of its members are a part of aviation or automobile companies and that many were educated in Mechanical Engineering Colleges. He asks these questions: "Is it a healthy, vigorous, solid beginning of an organization that is already crowding the gate for recognition; does it have a sound basis for its being; a field of its own to develop; or is it really a branch of Mechanical Engineering, Automotive, or Aviation Engineering?"

The text of his editorial continues:

"The answer lies with you men. Capable leadership of our Society has brought us to where we are. Capable leadership will, I believe, also do the job of getting it accepted. But there is more to be done than that—and that part is up to you.

"One thing you can do is to give your opinion to our Educational Chairman concerning the proposed Tool Engineering College Course. My opinion is that the Society can do no greater good for our profession than getting a Tool Engineering course installed in all major colleges and universities. Write to the Dean of the Engineering college you attended. Tell him about the ASTE. Urge him to strongly consider these proposals—make sure he has received them.

"Do these things and more—attend every meeting—make suggestions—urge and encourage all committees, especially the Publicity Committee—even get tough with them if you don't think they are doing the job—after all, it's your Society. We will never be more than you as an individual help to make it. We've got a good start. Let's don't stop until we take our rightful place alongside the Founder Societies."

Steel Casting Methods Keep Pace With Industry

Kansas City, Mo.—The steel industry's tremendous contribution to the Ordnance programs of the Army and Navy were emphasized by C. L. Harrell, Vice President, Sterling Steel Casting Company, East St. Louis, Illinois, speaking before a recent meeting of Kansas City Chapter.

In his address on "Steel Castings And Their Use In Industry," Mr. Harrell outlined the history of steel casting in America, illustrating with films, the scientific progress that has been made to conform with the requirements of modern industry.

James E. Bird, Professor of Metallurgy, University of Kansas and Kansas City Junior College, lectured on "The Description Of Steel In General," explaining the characteristics of steel and the heat treating of various types of steel.

Arizona Offers Trade Training Programs

Phoenix, Ariz.—Opportunities to aid in the training of young men who wish to engage in the field of production tooling were presented to Phoenix Chapter, ASTE, by John Kayetan of the Phoenix Vocational School and Russell Talbott, Assistant State Director of War Production Training. During the Chapter's July 26 dinner meeting at Westward Ho Hotel, both speakers reported on the progress of state and municipal vocational training.

Nearly half of those trained in war production in Arizona were taught in the Phoenix area, while 25% of the state's high schools offer vocational programs employing full-time industry and trade teachers, the speakers stated.

McMillen Superintendent For New Company

Evansville, Ind.—Howard C. McMillen has assumed his duties as Superintendent of the Production Engineering Division, Seeger-Sunbeam Corporation, having supervision of the Process, Plant Layout, Tool Engineering, Tool, and Standards Departments.

H. C. McMillen

The new company, a merger of the Seeger Mfg. Company of St. Paul, Minnesota, and the Sunbeam Electric Mfg. Company of Evansville, was formed last April. The Evansville Division produced Army Ordnance materiel during the war. Electrical refrigerators are its peacetime product.

Mr. McMillen went to Seeger-Sunbeam from the Aeroproducts Division of G.M.C., Dayton, Ohio, where he was Tool Supervisor. He had been associated previously with the Inland Mfg. and Frigidaire Divisions of G.M.C., in that city.

Born in Piedmont, Kansas, he was graduated from the School of Mechanical Engineering, Purdue University, with the degree of B.S.M.E. He is a Past Chairman of Dayton Chapter, ASTE.

ASME Invites Society To Sectional Meeting

Cincinnati, Ohio—The American Society of Mechanical Engineers, Cincinnati Section, has announced a two-day technical meeting to be held here October 2-3 at the Netherland Plaza Hotel. Essentially replacing the Society's Fall Meeting, cancelled in conformance with the request of the Office of Defense Transportation, the streamlined session is planned as a local meeting. Members of ASTE or of other technical societies, who may be in the vicinity of Cincinnati at the time of the meeting, are invited to attend the conference.

The program scheduled and other pertinent information may be had upon application to the Chairman, E. Mario Martellotti, % Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

Fort Wayne Group Sees Locomotive Manufacture

Fort Wayne, Ind.—Despite inclement weather, thirty-five members of the Fort Wayne Chapter visited the Lima Locomotive Works at Lima, Ohio, on Sunday, July 15th.

Welcomed to the plant by Assistant Works Manager F. J. Parsons, the party was divided into small groups who were ably directed throughout the tour by members of the plant's engineering and manufacturing staff. The Tool Engineers were fortunate in seeing the manufacturing sequence of locomotive building from the planing and setting of frames through to the last coat of paint and first toot of the whistle as the engine started on the company's eight miles of test track.

All manufacturing facilities were open to the guests, including the Shovel and Crane Division where self-propelled shovels, cranes, and drag-lines were in process.

Following the five-hour tour of the plant, the visitors were dinner guests of the Lima Locomotive Works at the Hotel Kirwin. After-dinner talks were given by F. C. Cutter, Works Manager; A. E. Feightner, Small Tool Supervisor; and R. E. Briggs, Jr., Shop Engineer, followed by a lively, off-the-record, round table discussion of manufacturing problems.

Arrangements for the tour were made by Member A. A. Feightner, Lima Locomotive Works, and Arthur Nichols, Entertainment Chairman.

Elmira Chapter Secures Outstanding Publicity
Tool Engineer Featured As Production Genius

Elmira, N. Y.—Persuasive and persistent efforts in "selling" the Society to the local press has borne fruit for Elmira Chapter, spotlighted in a half-page of publicity carried in a recent edition of the *Elmira Sunday Telegram*.

Reporting on the Chapter's concentration in this direction, Chairman George N. Morceau says, "The Sunday paper which featured the American Society of Tool Engineers, and especially Elmira Chapter, did so after much explaining concerning the aims and purposes of ASTE, the kinds of work in which the members are engaged, and the required qualifications for membership.

Press Seeks Society Data

"After learning these facts, the *Sunday Telegram* asked for information and material which could be used in a feature article. Society and Chapter history was gathered from every available source, assembled in chronological order, and turned over to the *Telegram*.

"Their interest was built up to the point where they were anxious to inform all and sundry that the Society was composed of key men in industry and not 'tool makers.' Perhaps similar explanations to newspaper men in general would help other Chapters."

The publicity is contained in two stories one of which was a signed feature by Staff Writer Wells Crandall, under the head, "TOOL ENGINEER: He's the Genius and Unsung Hero of a Mechanized War," with the sub-head, "His Innate Curiosity, 'Know How,' Has Made United States the Great Military Nation It Is."

'Know-How' Made Military Might

Mr. Crandall wrote: "Behind every cartridge and shell, every tank, bazooka, radar and all the implements of this vastly mechanized war lies the genius of an unsung hero. He's an imaginative chap with an insatiable curiosity whose innate 'know how' has made the United States the greatest military nation in history—the tool engineer.

"While it is true that the speed with which planes, tanks and guns have come from the production line has played a tremendous role in the victories, the accuracy with which this armored might has been manufactured and the complete and simple interchangeability of its parts have saved countless lives and shortened the war.

"AS EARLY IN the war as October, 1942, when the fate of this country still hung in the balance, Col. Earl McFarland, commanding officer of the Springfield Armory, said flatly:

> 'I think I can safely say that the entire productive effort of the war begins with the tool engineer. We could not have begun to turn out the weapons for battle if they had not first provided the means for making these weapons. . . . I feel that no other single group in the entire U.S. has done as much to forward the productive war effort as have the tool engineers of this country.'

Yankee Ingenuity Unsurpassed

"Behind the executive offices of every war plant in the Elmira area these key men of industry design the machines, the tools and the methods with that incomparable Yankee ingenuity that has no counterpart the world around.

"To their genius for speedy production they've added a new, almost unheard of accuracy in which the thousandth of an inch of World War I is an intolerable error. They talk of millionths of an inch and microns, thousandths of millimeters, with an easy familiarity while matching wits with the laboratory wizards of Germany and the other Axis powers.

* * *

"THEIR RESPONSIBILITY doesn't stop with the completed design on the drafting board. It ends in the shipping department—with the end-product of their creation. They are also the factory's 'bug' chasers who lend their talent to every department as the real planners of processes and methods of manufacture.

"Most of these men (and one woman) are members of Elmira Chapter, American Society of Tool Engineers. Born of the depression at Detroit in 1932, the national organization has grown to include 18,000 members and 72 chapters in the U.S. and Canada. It has members in England, Scotland, Wales, New Zealand and Australia.

Chartered 6 Years Ago

"When the Elmira Chapter was granted its charter on February 17, 1939, its first chairman was John R. Lynch, tool supervisor of Ingersoll-Rand at Athens. Succeeding chairmen are: J. Raymond Blank, tool designer of Ingersol-Rand at Painted Post; Conway D. Thomas of Remington-Rand, Elmira; M. Hugh Evans, chief engineer of Trayer

These are the alert officers of Elmira Chapter, whose joint publicity efforts culminated in a half-page feature in the *Elmira Sunday Telegram*. Left to right: Floyd B. Allen, Secretary; Lester F. Trew, former Treasurer; Burr W. Jones, 1st Vice-Chairman and Program Chairman; Dolph Kylor, Membership Chairman; Varner T. MacRorie, Education and Training Chairman; Charles W. Veitch, Program Advertising Chairman; George N. Morceau, Chairman; J. Raymond Blank, Advisory Chairman; Edward Stachel, 2nd Vice-Chairman; and M. Hugh Evans, Industrial Relations Chairman. Not shown are Past Chairmen John R. Lynch and Conway D. Thomas, members of the Advisory Board.

Products, Inc., of Elmira; Dolph Kylor, inspector at Eclipse Machine Division, and George N. Morceau, former tool and designing engineer of Hardinge Brothers, now manager of the tool and engineering division of LeValley, McLeod & Kincaid Co.

"Present officers with Mr. Morceau are Burr W. Jones, first vice-chairman; Edward Stachel, second vice-chairman; Lester F. Trew, treasurer, [Mr. Trew has since moved to Woodbury, Conn., and Mr. James F. Deegan has taken over his duties as Treasurer] and Floyd B. Allen, secretary.

* * *

"PRACTICALLY EVERY industry within a radius of 35 miles of Elmira has one or more members in the chapter whose membership has grown to 150. Meetings are held the first Monday of every month excepting June, July and August.

Learns Latest Methods

"To the tool engineer the society is a school which keeps him in close touch with the latest progress in a score of the key functions of manufacturing. If a curriculum were arranged it would include the following subjects:

"Cost and production estimating, cutting tool design, design of production machinery, die, jig and fixture design, industrial design, industrial engineering, industrial management, industrial organization, management problems, manufacturing laboratory, manufacturing practice, machine shop practice, manufacturing engineering, tool practice, metal processing, micromotion study, production control, production engineering, selection of manufacturing equipment, time and motion study, time and motion laboratory, shop work and work routing.

"According to Mr. Morceau, the Society is neither a political organization nor a union. 'It vigorously opposes,' he says, 'any attempt, political or otherwise, to stultify this nation's tremendous productive capacity. It has become influential, not so much because of its numbers, but because of the importance of the service its membership renders.'

Inventive Genius Adaptive

"The native curiosity of the tool engineer, forever alert to new applications, new methods and any practicable improvement for speed-up or design, often swings to other fields. One local tool engineer who has been concentrating on Navy shell fuse production designed a diving bell in his spare time. Another built a motorboat after a design which excels production-model craft.

"Tool engineers say that a man cannot become a tool engineer by a diploma alone. He must be born with an innate curiosity. Then an effective education superimposed upon this curiosity turns his 'know why' into the 'know how' that makes a tool engineer."

Headed, "U.S. Has No Schools, Colleges For Training Tool Engineer; Society Would End Situation," the second article reads: "America has no schools, colleges nor universities where a boy or girl can study to become a tool engineer.

"The 18,000 members of the American Society of Tool Engineers have resolved to uncover what they describe as 'a wealth of hidden mechanical and inventive talent' by making postwar plans for an extensive educational program.

"Since 1940 the Elmira Chapter through Varner T. MacRorie, chairman of its educational committee, has been watching developments of such curricula in engineering colleges, high schools and trade schools as well as in federally-sponsored institutes for returned servicemen.

"Here's the way George N. Morceau, chairman of Elmira Chapter, views the need: 'The American way of life is longed for by common folks the world over. It is the way of life that rewards individual effort. Knowing that as free men we can get what we work for, we permit ourselves to want a lot of things. We are continually seeking to devise mechanical aids to make our labors most effective so that we can have time for other things besides work.

Production For Leisure

"'Free men demand these things. Tool engineers provide them. It was such a scheme of things that brought the tool engineers into being; that evolved the ASTE and which will insure the continued growth of the society.'

"Tool engineers believe that industry and the international society will have to combine to bring out the talent in many students attending industrial and engineering schools if the vast number of such engineers needed in the postwar effort is to be available.

"They aver that a mechanical engineer with a diploma from the highest accredited engineering college in the country may have less talent for designing tools and determining factory methods than many a lad studying a trade in a high school shop course.

"For three years they've literally been 'in the market' for every young man or woman who showed curiosity about mechanical things beyond the tenets and axioms of the text books. These are the people who make tool engineers."

A view of part of the Department of Tooling and Methods at Eclipse Machine Div., Bendix Aviation Corp. and several photos of various Chapter officers at their desks were included in the half-page layout.

Oliver And Linsley In New Editorships

New York—Frank J. Oliver, former Technical Editor of *The Iron Age*, is now associated with Gage Publishing Company as Editor of *Electrical Manufacturing*. Widely-experienced in editing and engineering, Mr. Oliver has been on the staff of *The Iron Age* for the past 9 years.

F. J. Oliver

Prior to this he served as Industrial Co-ordinator at the College of Engineering, University of Detroit. Earlier connections included editorships on *American Machinist* and *Product Engineering*, and engineering posts with SKF Industries, New York; Edison Lamp Works of G.E. Co., Harrison; J. M. Lehmann Co., Lindhurst; and The Gregg Co., Hackensack, N.J.

A native of Summit, N.J., Mr. Oliver was graduated from Stevens Institute of technology in Hoboken with the degree of M.E. A Past Chairman of Northern New Jersey Chapter, ASTE, he is a member of ASME, SAE, Society for Promotion of Engineering Education, and Tau Beta Pi.

New York—Horace E. Linsley, previously Technical Advisor of Public Relations, Wright Aeronautical Corporation, Patterson, New Jersey, has been named Technical Editor of *The Iron Age*. During his twelve years with Wright Aeronautical, he handled many technical writing assignments, in various capacities.

H. E. Linsley

Born in London and educated at Hymers College, Hull, England, he served his technical apprenticeship with Ardol Company, Selby. His first engineering position with with Cie. Nationale des Radiateurs, Paris, France. For a number of years he was located in Buffalo, New York, employed successively at Colonial Radio Company, Pierce-Arrow Motor Car Company, and Curtiss Aeroplane & Motor Company.

Mr. Linsley, a former flying officer in the RAF, is a member of the Army Ordnance Association and the Institute of Aeronautical Sciences, and a Past Chairman of Northern New Jersey Chapter, ASTE.

New District Manager For Heppenstall

Chicago, Ill.—James C. Patton, Jr.'s advancement from Sales Enginer for the Detroit branch of the Heppenstall Company, Pittsburgh, Pennsylvania, to District Sales Representative in charge of the Chicago area has been announced by his company.

Mr. Patton's ten years' association with the Heppenstall Company follows a long period of service in various capacities, with Great Lakes Forge Company.

In taking up his new duties, he is returning to his native city where he was educated at Armour and Lewis Institutes. He also studied at the University of Minnesota in Minneapolis.

A member of AISE and ASM, Mr. Patton has been affiliated with Detroit Chapter, ASTE.

Sales Manager Promoted

McKeesport, Pa.—Lloyd R. Clowes, former Pittsburgh District Sales Manager for Firth-Sterling Steel Company, has been appointed Assistant General Sales Manager of the company.

L. R. Clowes

Before joining Firth-Sterling, Mr. Clowes for two years was chief of the Cutting Tools Section and Chief of the Gage and Precision Tools Section of the War Production Board's Tool Division. For 23 years prior to serving with WPB, he was associated with L. S. Starrett Company of Athol, Massachusetts, manufacturers of precision measuring tools.

Now a member of Pittsburgh Chapter, ASTE, Mr. Clowes has previously been affiliated with Cleveland and Potomac Chapters.

Conley's Plan For Welding Historic Bell Strikes Responsive Chord In England

Cleveland, Ohio—Interest in the possibility of repairing Big Ben and other war-damaged English bells, by the same method he recommended to Congress for restoring the Liberty Bell, by arc welding, is evident to W. J. Conley, Consulting Welding Engineer to The Lincoln Electric Company.

Victory Casualty

Reputed to have cracked in ringing out the nation's first proclamation of freedom, the Liberty Bell now rests in Independence Hall, Philadelphia. Welding the crack, so that the bell could sound forth Victory over our recently-conquered enemies was urged by W. J. Conley of Cleveland Chapter, ASTE.

In a letter recently received by Mr. Conley, G. Parsloe, B.A., Secretary of The Institute of Welding of London, wrote: " . . . As you will no doubt know, there are many bells in this country which have suffered damage during the war, and it is even said that Big Ben (the bell which strikes the hours in the Clock Tower of the Houses of Parliament at Westminster) has been cracked for some time. If the crack in the Liberty Bell can be welded successfully, it may be that the same principles could usefully be applied over here."

Mr. Conley, a member of Cleveland Chapter, ASTE, replied, in part: "I have heard rumors that the Big Ben has a slight crack, and I always listen on Atlantic broadcasts to see if I can detect it. I can well appreciate the fact that many of England's bells have been damaged, and I congratulate the English people on their desire to weld them and thus preserve their traditional symbols.

"Of course, I do not need to tell you that many, many bells have been welded and that there is nothing mysterious in the process. Just a short time ago I checked a bell in Connecticut which had been welded almost ten years ago and was told that the bell was still in service and had its original tone restored.

"There are, of course, numerous methods of welding bells including both metallic and carbon arc processes. However, I still feel that for a bell the size of the Liberty Bell, the method and procedure outlined in my original letter to Speaker Rayburn is the best."

In a recommendation to Congress, Mr. Conley outlined the method by which the Liberty Bell's tone could be restored by welding, as reported in the February issue of *ASTE News*, and asked that a congressional committee be appointed to study the possibility of making the repairs before the day of final victory so that on that day:

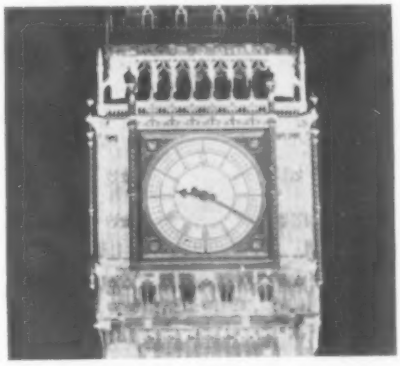
"The symbol of Liberty may be heard by the miracle of radio across the land and around the world, just as the principles of Liberty established in America by our forefathers have reached throughout the world."

Speaker of the House Rayburn's reply to the recommendation, Mr. Conley said, was that the matter would be referred to an appropriate committee. The letter from England prompted Mr. Conley to write again to Speaker Rayburn, urging him to act on the recommendation.

Asserting his admiration for British determination to keep alive their traditional symbols, Mr. Conley said that he had forwarded his engineering studies on the procedure for repairing the Liberty Bell to the Institute of Welding in England, but he hoped that Congress would lead the way by taking immediate action on repairing the Liberty Bell.

While efforts to have the Liberty Bell restored to service before V-J Day did not materialize, they did result in an offer to recast the bell, from the English firm that made the first of the bell's three castings.

Much in demand as a technical speaker, Mr. Conley has addressed many Chapters of ASTE, on various phases of welding.



War Victim

Often heard as an introduction to Winston Churchill's addresses, Big Ben, the bell in the Clock Tower of the Houses of Parliament, London, is said to have suffered war damage. Interest in repairing the bell by American welding methods has been manifested in England, according to ASTE'er W. J. Conley.

Boston Port Improvement To Prosper New England

Worcester, Mass.—Development of the natural advantages peculiar to the Port of Boston which is nearer to both northern Europe and South America than other Atlantic ports was urged by Major Arthur H. Tulley, guest speaker at a recent meeting of Worcester Chapter.

Benefits which all New England would derive from the improvement and expansion of Boston's port facilities were pointed out in Major Tulley's address, "The Construction and Development of the Port of Boston." In addition to serving on the Board of Directors of the Port of Boston, he acts as State Chairman of the Massachusetts Aeronautics Commission. His discussion also gave his audience a very clear insight into the future of air transportation.

Lieutenants Henry Lavoylette and Russell Mills related their experiences in the European war.

FILM FLASHES

**Three To Be Served*—Dramatizing the economic principle that can produce better living standards for all, this film presents a refreshing approach to a subject of interest to every American concerned with his part in the postwar era.

A modern parable with a message, the production gives everyone who sees it a better understanding of his place in modern society, as worker, consumer, investor—or all three. Running time of the 16mm. sound film is 27 minutes.

Available upon request from Motion Picture Editor, National Industrial Information Committee, Room 307, 444 Madison Avenue, New York 22, N. Y.

* * *

**This Plastic Age*—Introducing in full color some of the varied achievements of the plastic industry and the myriad wonders it produces, the film proceeds to reveal how plastics are manufactured, how they are molded and extruded into these forms.

The camera travels through manufacturing plants, showing molders at work, the making of a mold, and the finished products as they are taken from the presses. It illustrates how plastics differ in production from other materials, how quickly and easily they are formed into everyday products.

The 16mm. color-sound film may be borrowed from Modern Plastics Magazine, 122 E. 42nd Street, New York City.

* * *

**The Magic Wand Of Industry—Arc Welding*—Staged and photographed in practically every major industry in America, the film tells a full and fast-moving story of this miraculous process.

Filmed in full technicolor and sound under the expert technical direction of welding engineers, it portrays the action, results and possibilities of arc welding in a manner that holds keen interest and makes a deep impression. Fundamentals of the process, the electrical circuit, typs of welded joints, and the true action inside the arc are all explained, and revealed in closeups. Running time, 25 minutes.

Presented by The Lincoln Electric Company, Cleveland 1, Ohio.

* * *

The Manufacture Of Dies—Describing the manufacture of lamination dies from Huron, High Carbon-High Chromium die steel, the new film supplements other Allegheny Ludlum productions, discussing stainless, tool and electrical steels.

Requests for the 10-minute, color-sound film should be addressed to Allegheny Ludlum Steel Corporation, Brackenridge, Penna.

* * *

**Induction Heating* — An accurate process, hardening only the area described, treating with a predetermined heat to the desired thickness and degree of hardness, induction heating makes available metals which could not otherwise be used. The heat treating of inside diameters of cylindrical shapes and the results attained are shown in color and sound in this 12-minute film.

Budd Induction Heating, 11811 Charlevoix Avenue, Detroit 14, Michigan, will lend prints upon request.

*Literature available from ASTE Headquarters.

News Wanted . . . From Chapters . . . Of Meetings . . . Of Members

Others enjoy reading about your Chapter and its members. When they secure promotions, new positions, or recognition for special achievements, tell us about it so we can tell the world. If a member passes away, send us an obituary. Let us know promptly and adequately what your technical speaker said.

The relative amount of publicity **your** Chapter and its members receive is limited only by the **quantity** and **quality** of material which you send in. No great writing ability is required. The *News* staff will dress it up for you editorially, if necessary. Simply send in an account of what took place, relating newsworthy items—human interest notes, highlights of your speaker's address, special events on your program, distinguished guests present. Photographs (glossy-prints preferably) should accompany stories, whenever possible, to add interest to the text matter and to make the magazine attractive.

News about individual members should be reported—promotions, changes of business affiliation, interesting non-ASTE activities of its members (obituaries, too.) (Try to secure a photograph of the member concerned.)

As the technical (or other) speaker at a Chapter meeting is talking, make notes of the highlights of his address, for incorporation in your report to Headquarters. Contrast the news value of the following excerpt:

"Mr. L. W. ———, Sales Engineer with the ——— ——— Company was introduced by our Chairman. Mr. ———'s talk and slide illustrations were very interesting."

(Hardly exciting reading, is it?)

To these:

"Industry will never return to the wider tolerances in use before the war, Mr. L. ——— of the ——— Corporation told 150 members and guests of the ——— Chapter at the September 5 meeting. Speaking on 'Precision Inspection,' Mr. ——— pointed out that smaller shops throughout the nation are now equipped for the first time to produce to close tolerances. In general, he said, tolererances are now around 1/5th of what they were before the war—specifications to .0002 inches being as common now as .001 was before the war. His talk was illustrated by slides showing numerous new inspection devices developed to make accurate production control easier. Some of these will measure even the thickness of a fingerprint on metal."

"Mr. W. A. ———, Special Engineer for the ——— ——— Company, in a paper on 'Perishable Tools on the Firing Line,' before 100 members and guests listed five ways to make cutting tools last longer. These are: (1) The right tool for the job, (2) proper feeds and speeds, (3) proper grinds, clearances, etc., (4) proper coolant and lubricant, (5) fine finish grinds. Four additional means of providing protection and longer tool life were also discussed. These are still in the experimental stage according to Mr. W. A. ———. They are: 1) nitriding, (2) sub-zero treatment, (3) microblast and (4) flash chrome plating. Also mentioned in his paper were the three conventional means of reclaiming tools: (1) regrinding in the hard, (2) build up welding, (3) low temperature brazing."

You can draw your own conclusions as to the relative interest of others in such reports from you. Remember, too, that frequently some of the **most interesting** things are brought out in the **discussion** which follows the paper.

By the way, and **this is important**:

The publication schedule of *The Tool Engineer* makes it necessary for Chapter news to **reach Headquarters** by the **15th** of the **preceding** month. This means that reports of September meetings must be at the National Office by September 15th for insertion in the **October** issue. The **earlier** the stories arrive, the more **complete** and **interesting** their contents, the **better coverage** they will receive. (If your Chapter meeting occurs **after** the 15th of September and your report is received promptly, the story will be in the **November** issue.)

This applies also to **Announcements** of meetings. To appear in the October issue and help build your attendance, they must also make the September 15 deadline. However, if your October meeting takes place during the first fifteen days of October the announcement should have been in the September issue (received at Headquarters by August 15) to do your Chapter any good.

The sample calendar schedule below graphically illustrates these points.

- Chapter Meeting Date
- ▼ Closing date at Headquarters for reports of **current** month's meetings for publication in **next** month's issue.
- ◆ Closing date at Headquarters for announcements of October meetings occurring **before** the 15th of October.

To facilitate your work, two forms have been prepared. If your supply of these is low, ask American Society of Tool Engineers, 1666 Penobscot Building, Detroit 26, Michigan, to send you some. The **blue** form is for reporting news after the news event has occurred; the **green** form is for announcements of coming meetings. Both are self-explanatory.

Don't let **your** Chapter be neglected in print. Don't send us too little—too late. Get **something** into every issue of *The Tool Engineer.*

Rose Relates Rigors Of Enemy Occupation

Washington, D. C.—After enduring the vicissitudes of four years of enemy occupation in France, during which he was subjected to bombings, had his family taken hostage, and was forced to assist the Germans in war production, Lucien F. Rose, an at-large member of ASTE, welcomed, with all France, that country's deliverance at the hands of the Americans.

L. F. Rose

A native of Paris and former editor of *La Machine Moderne*, Mr. Rose is now assigned to Washington as head of the Machine Tool Section at the French Government's Mission of the Ministry of Industrial Production.

In relating his experiences after the fall of France, Mr. Rose says:

"I am at a loss to describe those four years full of events for all of us. I can only say that I was called to join the Army in August of 1939 and assigned to the Ministry of Armament in January of 1940. I remained there, in the machine tool division, until the armistice when I resumed my duties as editor of the publication, *La Machine Moderne*, which the Germans did not allow us to publish until later in 1941.

"In the meantime, I acted as head of the Commerce Division of the Committee for Machine Tools, grouping all of the industry. It was through these Industry Committees, to which every firm had to belong, that the distribution of raw materials and supplies was effected, which permitted the enemy to control all industrial activities.

"I left this work in 1942 to be at the head of a de-tinning plant until December, 1944, when I was asked to go to Washington to act as head of the Machine Tool Section at the Mission of the Ministry of Industrial Production here.

"During the occupation, the word 'production' lost its meaning. It meant to produce as little as possible without getting into trouble. And the trouble at that time was, of course, making both ends meet, not being caught slowing up and also keeping the men from being sent to Germany.

"The next preoccupation was to see that the family, and especially the children, could get enough to eat. Most of us sent them to the country, near the farms, which also solved the question of security from bombings. Our home in Paris was near a certain automobile plant which was badly hit while we were in our apartment, however without injury to us except for the disconcerting sensation of hearing the building split in two by the shaking.

"Other experiences included a bombing of the plant where I worked, by fighter bombers, and the time all of the inhabitants of our village, including my family, were taken as hostages by an escaping German armored column attacked in our village by the underground.

"Finally, our meeting with the first American soldiers, Captain J. J. Cowen of Louisville, Kentucky, and Lieutenant R. E. Fuhrman of New York, with whom we shared the news of liberation.

Ten Years Ago In *The Tool Engineer*

September, 1935—"The largest machine tool show ever held" and the Third Machine Tool Congress featured the issue. Scheduled for September 11-21 at the Cleveland Public Auditorium and conducted jointly by the Machine Shop Practice Division, ASME; Production Activity, SAE; ASTE; Cleveland Engineering Society, and the NMTBA, the Congress was "to provide a neutral forum wherein engineers, users, distributors and producers may discuss freely all questions of mutual interest concerning the design and utilization of machine tools."

Boat Chartered

A special, all-expense trip was arranged for ASTE members, including round-trip transportation from Detroit to Cleveland on the S.S. Greater Detroit, berth accommodations, breakfast on the boat, admission to the 1935 National Machine Tool Show, to the banquet and ASTE technical session of the Machine Tool Congress, as well as souvenirs—all for $10.

The evening session on Friday, the 13th, was under the direction of ASTE. Principal speakers were Past President W. H. Smila, slated to discuss "Standardization of Machine and Tool Data," and A. H. d'Arcambal (destined to be President) whose subject was "Trend of the Development of Cutting Tools." President R. M. Lippard was Chairman of the Hotel Statler dinner meeting.

Enthusiasm for the show, sponsored by the National Machine Tool Builders Association and the first to be held in six years, was unbounded. Attendance at the 5.3-acres exhibit was expected to reach 25,000. Delegates from overseas were to be honored with a formal dinner. One exhibitor, celebrating his 50th business anniversary, was to have his booth done in **gold.** (And those times were called "hard"!)

* * *

Then as now the President, in his message, urged the Society, through its members, to find a place in the sun . . . R. B. Nuckols was named Assistant Sales Manager of the Standard Tool Company . . . Neely Powers of the Universal Steel Company, Cleveland, was elected President and General Manager of the then-recently re-incorporated Colson Corporation of Elyria, Ohio . . . Westinghouse Electric's air conditioning department was being moved from East Pittsburgh, Pennsylvania, to Mansfield, Ohio . . . J. W. Corey, Sales Manager, and S. B. Taylor, Works Manager, became directors of the Reliance Electric & Engineering Company.

$1,000,000 Plant Expansion

At Fort Wayne, International Harvester Company was spending $1,000,000 on an expansion program, including a machine shop and repair department . . . among Detroit Scandinavians present at an outing addressed by W. S. Knudsen, then Vice-President of General Motors, were ASTE'ers Carl J. Oxford and George Ringstad . . . the construction and equipment of four modern buildings to produce "a new 1,000 h.p., liquid-cooled aircraft engine—one of the most powerful aviation power plants made in this country" was announced by Allison Engineering Company at Speedway, Indiana.

New engineering books just published by Professor Orlan W. Boston, Director of the Department of Metal Processing, University of Michigan, included a continuation of "A Bibliography On The Cutting Of Metals" and Volume II of "Engineering Shop Practice."

O. B. Jones, in his editorial, "Who Is A Tool Engineer," predicted; "Starting a half-century ago, a peculiar type of mechanical genius began pulling itself away from traditional and legendary engineering and began to develop ideas of interchangeable manufacture. Their ideals are far from being attained. Tremendous strides will be made by them in the coming decade making us ashamed of our 1935 crude manufacturing methods . . . the Tool Engineer, regardless of the title under which he has labored in the past, is the one who has done the actual tool or production engineering which because of its effect upon our everyday mode of living, causes the average citizen to have faith that, if he has the 'down payment,' any luxury of which he might dream can be his."

Strid Joins Foote Bros.

Chicago, Ill.—Oscar W. Strid, formerly associated with the Dodge Chicago Plant, a division of Chrysler Corporation, as Assistant Supervisor of Tool Engineers in the Gear Division, has assumed the responsibility of Product Engineer in the Research and Development Department of Foote Bros. Gear & Machine Corp. Engaged in developing new ideas and new applications for speed reduction and power transmission units for all industrial purposes—particularly for the aircraft industry, the department conducts all tests of experimental units.

O. W. Strid

Prior to his connection with the Dodge Chicago Plant, Mr. Strid had been Process Engineer for Gears with Electro Motive Division, General Motors Corporation, La Grange, Illinois; and Assistant Estimator of Gear Division, D. O. James Mfg. Company, Chicago.

He received his technical training at Tri-State College, Angola, Indiana; and Illinois Institute of Technology, Chicago. An active participant in the functions of Chicago Chapter, ASTE, Mr. Strid is also affiliated with the Western Society of Engineers.

Neolithic Man First User Of Abrasives

Los Angeles, Calif.—The use of abrasives, from their origin with the Neolithic man who sharpened his stone tools by abrading, down to the present development and manufacture of diamond wheels, was narrated by A. L. Ball, Director of Research, Felker Manufacturing Company, Torrance, California, at the August 9 dinner meeting of Los Angeles Chapter.

Shown with Chairman Arthur D. Lewis are the technical speakers at August 9 meeting of Los Angeles Chapter. Left to right (standing) are: Al Janke, Western Field Engineer, Cincinnati Milling Machine Company, Cincinnati, Ohio; and Mr. Lewis; (seated): A. L. Ball, Director of Research and W. R. Pratt, Chief Metallurgist, Felker Manufacturing Company, Torrance, California.

Continuing from this point, W. R. Pratt, Chief Metallurgist for the Felker firm, described the manufacture and use of diamond wheels in modern industry, illustrating his remarks with slides.

"Researches In High Speed Milling," the subject presented by Al Janke, Western Field Engineer for Cincinnati Milling Machine Company, Cincinnati, Ohio, was augmented with ultra-high-speed motion pictures, revealing in slow motion what occurs at high speeds in milling.

The mid-summer meeting was attended by 155 members and guests.

* * *

Chapter members, their families and friends, numbering approximately 350, picnicked at Reseda Park in San Fernando Valley, July 22. A continuous program of games, sports, and athletic events, climaxed with a barbecue dinner, regaled the party throughout the day.

Snapped on the shores of the Rock River, during a recent meeting of Tri-Cities Chapter at the Olive Singers Home, near Moline, Illinois, are five of the Chapter's Past Chairmen. Left to right: F. J. Siebenmann, W. Z. Fidler, Sigurd Lunde, T. L. Ramsey, and O. R. Reller. This group presented to Cedar Rapids Chapter, on the occasion of its recent chartering, a chairman's gavel with an appropriately inscribed marble block.

Reynolds Goes To Europe On Government Mission

Detroit, Mich.—C. H. Reynolds, Vice President, The Sheffield Corporation, has been named by the War Department as one of a group of American businessmen to inspect industrial plants in Europe.

C. H. Reynolds

Mr. Reynolds was chosen for this assignment because of his broad knowledge of engineering and manufacturing processes. He is now in Europe and is expected to remain for several weeks.

Widely-known in the gage, precision instrument, machine tool and automotive industries, he has been associated with Sheffield and its predecessor companies for a quarter of a century. For many years he has made his headquarters in Detroit where he is affiliated with the local ASTE Chapter.

Dowd Made Assistant To Vice President

Hudson, Mass.—Edward M. Dowd, General Superintendent of the Lapointe Machine Tool Company, was recently promoted to the position of Executive Assistant to John J. Prindiville, Jr., Vice President.

E. M. Dowd

Mr. Dowd, a member of Boston Chapter, ASTE, came to the Lapointe plant some months ago from the American Bosch Company where he was Superintendent in charge of engineering and manufacturing postwar products. His previous experience had been as Master Mechanic at the Hendy Machine Company of Torrington, Connecticut, and as Assistant Chief Manufacturing Engineer at the Springfield plant of the Rolls Royce Company.

Barber Forms New Company

Chicago, Ill.—Thomas C. Barber has announced the opening of his offices at 140 North Dearborn Street, under the firm name of "Tool Service For Industry." Mr. Barber's company has exclusive sales and engineering representation in this territory for Buhr Machine Tool Company, Ann Arbor; Carbide Fabricators Company, Royal Oak; Morse Tool Company, Detroit, Michigan; and Kelly Reamer Company, Cleveland, Ohio.

T. C. Barber

Formerly engaged at the Dodge-Chicago Engine Plant in the specification of machines, tools, fixtures and gages used in the production of Curtiss-Wright engines, Mr. Barber was earlier employed at the Ford Willow Run Bomber Plant near Detroit, in the co-ordination of final assembly of the first two bombers. At Dearborn, Michigan, he was associated with Ford Motor Company in the building of metal sample bodies of Ford cars, the Ford "jeep," command car, and the bomb loader.

One of the earliest Ford Trade School graduates, Mr. Barber was for 30 years a resident of Detroit where he was affiliated with the local chapter of ASTE until transferring to Chicago Chapter.

BUY VICTORY BONDS 8th WAR LOAN

1

2

3

4

Tell Your Story In Pictures

The montage at the left illustrates how Chapter activities can be graphically portrayed in pictures.

Augment your meeting reports to ASTE Headquarters with a selection of photos **adequately identified.**

Prints will be returned after engravings are made, if you so request.

COMING MEETINGS

BALTIMORE—Fall Dance, October 19, at the Emerson Hotel, Baltimore. Music by Billy Isaacs.

Cleveland Defies Superstition With Jinx Golf Party

Sleepy Hollow Country Club, Brecksville, Ohio, was the scene of Cleveland Chapter's outing held Friday, the 13th of July. The happy faces of those participating indicate that no ill fortune befell them on the ominous day.

1. Checking the score.

2. The Committee lines up at the 18th hole. Left to right: Harold Peiffer, Arthur F. Bush, H. D. Andress, James E. Abella, Harry B. Osborn, John R. Fitzsimmons and Andrew Barth. (Others unidentified.)

3. President H. D. Andress (extreme right) of Cleveland Technical Societies Council holds flag for Warren Fitzsimmons (extreme left) while the bystanders lend moral support.

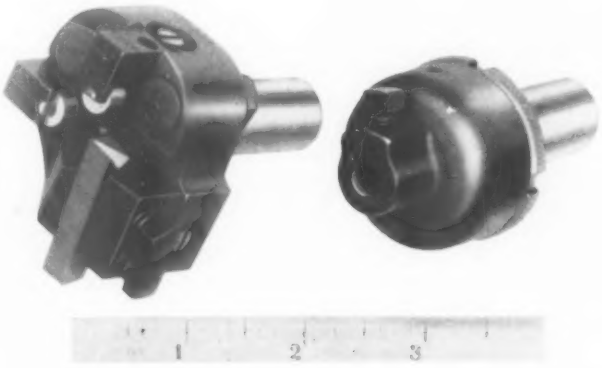
4. Part of the group of hungry golfers shown at dinner in the banquet room of the Sleepy Hollow Country Club.

TOOLS OF TODAY

The function of this department is purely introductory, hence, mention is confined to what the tools are and what they do. For further details, the reader is referred to the makers.

"Featherweight" Turret Tools

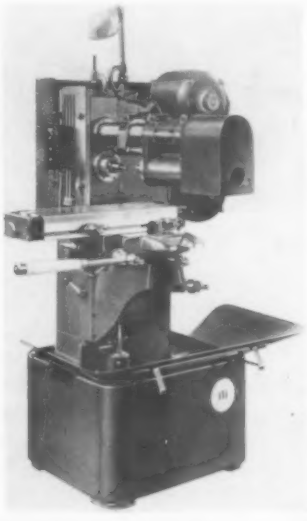
SEVERAL new TURRET TOOLS by *Boyar-Schultz Corp.*, 7310 Walnut St., Chicago 12, should be of interest to producers of small screw machine products. These include the new "Featherweight" Model 000D *Floating Tool Holder*, shown at right (above the scale), and the Model 000RT *Screw Machine Tool* for turning extra small parts. With this tool, diameters as small as .075 may be turned with rollers; .020 with carbide blocks. The scale shows comparative sizes.



A larger Tool Holder—Model 3RT—is similar in appearance to the Model 000RT, and has a range from 5/16" to 1¼" diameter × 3¼" length of cut.

Double Spindle Milling Machine

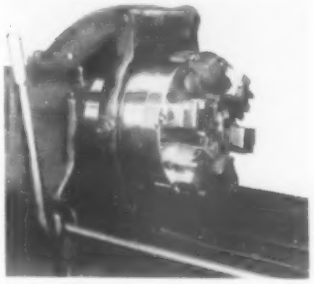
DESIGNED FOR light production work requiring minimum duty milling in metals and plastics, a TWO-SPINDLE OPPOSED MILLING MACHINE permits two cuts to be made simultaneously, with resultant savings in set-up and production time. An interesting feature is that the spindles may be lined up or staggered, as required.



Another model, not shown, can be supplied with identical over and under spindles, with vertical adjustment of centers from 4½" min. to 7½" max. These machines are the product of *W. H. Nichols & Sons*, 46 Woerd Ave., Waltham 54, Mass., recently awarded its 5th Army-Navy "E" for efficient production of war material for the armed forces.

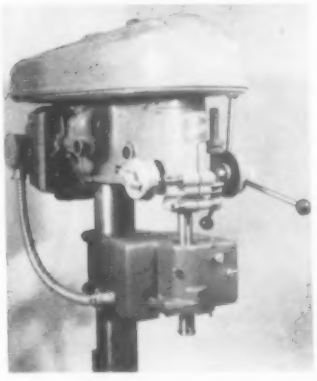
Lanco Semi-Receding Die Head

COMING AS A Post War Product, by the *Landis Machine Company*, Waynesboro, Pa., is a new LANCO 4", Semi-Receding, 6 chaser Die Head employing the recently announced Lanrac Chasers. This will provide a more accurate and rapid method of interchanging and setting chasers, also, the semi-receding action will eliminate the possibility that the chasers may leave "off" marks on the thread as the head opens up. The head will have a capacity of from 2½" to 4" pipe thread, and any desired length within the length standards for these sizes may be readily obtained.



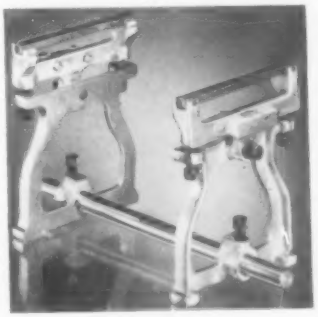
New Model Tapping Attachment

A NEW MODEL ROTOREX PRECISION TAPPING ATTACHMENT, by *Douglas Machinery Co.*, 150 Broadway, New York 7, is applicable to all popular model drill presses and provides for Class 3 threads, with unskilled labor, in sizes 0-80 to ⅞". The attachment incorporates a lead screw, assuring precision tapping with depth control within .010". Features include instantaneous, emergency reverse, complete automatic cycle and foot control which leaves operator's hands free for loading.



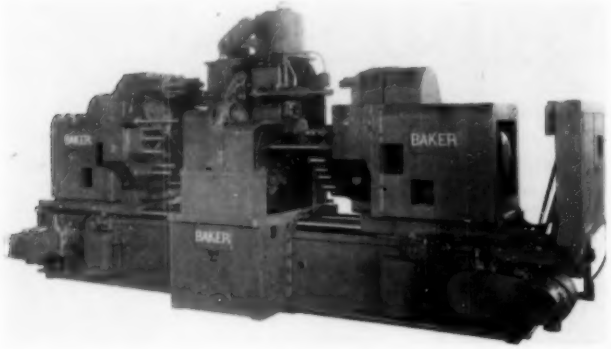
Static Balancer

A LOW PRICED, precision STATIC BALANCER, of 9" swing and 50 lbs. supporting capacity, is offered by *Samuel S. Gelber*, 34 S. Jefferson St., Chicago 6. The balancer is compact and readily portable, and may be set up on any reasonably level surface.



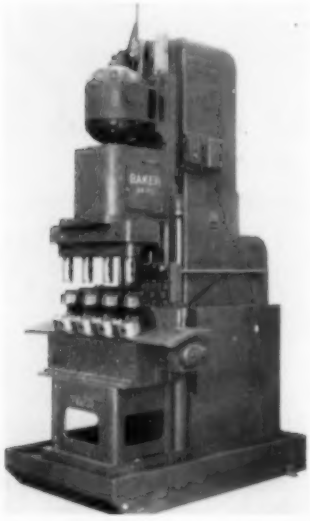
The balancing surfaces have built-in levels and fine adjusting screws providing for accurate settings. In addition to static balancing of rotating parts, a plate glass may be leveled on the ways, thereby providing an accurate surface plate for inspection.

Baker Automatic Cycle Machine



TWO NEW MACHINES, embodying standard but improved drill units, are recent products of *Baker Brothers, Inc.*, Toledo 10, Ohio, which recently received its second Army-Navy "E" award. Both machines are for operations on nozzle plates for Navy rocket shells.

The first machine combines two Baker 3½ x 24 Hydraulic Feed, floor-type units into one two-way machine with trunnion fixture. The nozzle plate handled is 5" diameter and has 8 taper holes, 1¼" at the large end, on a 3⅜" circle, and all holes must have a good finish. All operations are handled at one chucking, with one part produced at each cycle of the machine.



The second machine, which is basically a standard Baker 26 HO, is rather unique in its tooling. It is equipped with a special 4 spindle fixed spindle head, and a fully automatic cycle fixture arranged with four 3-jaw chucks each of which is automatically indexed. The work handled is approximately as described above.

The holes being on an angle does not allow for conventional multi drilling. So, the machine works on four nozzle plates at once, one hole being drilled in each piece. The machine works on automatic cycle until all 8 holes are drilled, the result being that four parts are produced in the time ordinarily required for one. It's a rugged job, drilled from the solid, and taking rugged machines.

Improved Steel Stamps

A STEEL stamp, of improved quality, has been developed by the *Acme Marking Equipment Co.*, of which it is said that clear impressions can be obtained without the common fault of a chipped or mushroomed striking head.

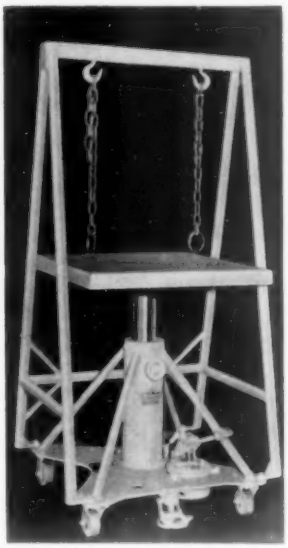
Chipping and mushrooming of the striking head is eliminated by a special process of heat treatment and tempering.

Acme also produces a complete line of marking, stamping, and embossing equipment as well as badges, name plates, seals, and shipping room supplies.

A descriptive circular on these stamps—known as "Rams Head"—and other Acme products may be secured by writing the makers at 2222 W. Fort St., Detroit 16.

Die Separator for Elevating Table

AS A NEW optional feature for their portable Hydraulic Elevating Table, *Lyon-Raymond Corp'n.*, 2342 Madison St., Greene, N.Y., announces a DIE SEPARATOR which fastens to the base of the table with four bolts with wing nuts.



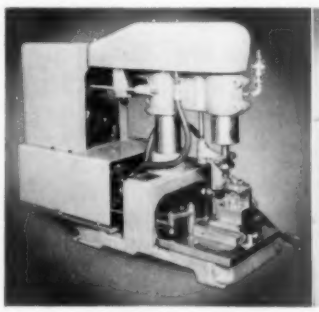
With this combination, dies are separated by elevating the table top, fastening the top section of the die to the superstructure by means of chain or links, then lowering the table, which carries the bottom section of the die.

Being readily demountable, the Die Separator does not limit the use of the table which may quickly be made available for such work as the transferring of dies in and out of presses, the support of overhanging materials, an adjustable height assembly bench, and the many other handling and work positioning tasks for which it was designed.

Automatic Operating Fixtures

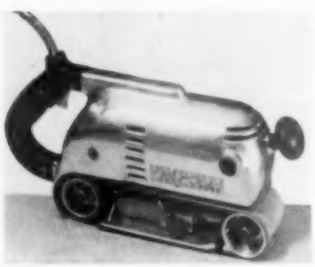
DESIGNED TO convert hand operated machine tools to automatic control, a new OPERATING FIXTURE by *Pond Engineering Company*, 15 Park St., Springfield, Mass., "takes over" all manual operations except renewing the feed. Work is located, clamped, brought to the cutter and removed after machining, the whole entirely automatic and the cycle repeated for each feed trip or continuously should feed be continuous.

There are three motivating forces:—electrical, mechanical and pneumatic, and feed of workpieces may be by hopper, fingers or other suitable auxiliaries. The fixtures are readily detachable, may be transferred from machine to machine and are easily adjusted to re-tooling.



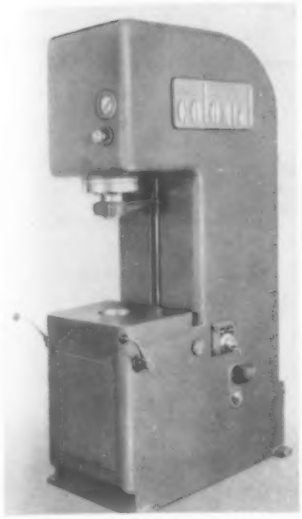
"Take-About" Surfacer

SUITABLE TO almost any industry, as metal or woodworking, a PORTABLE SURFACER by the *Porter-Cable Machine Company*, Syracuse 8, N.Y., will save time and effort in removing paint, refinishing old or finishing new surfaces. The Model A-3, shown, employs a ¾ H.P. universal motor and weighs 14 lbs.



Hydraulic Assembly Presses

ESPECIALLY DESIGNED for assembly work, a line of HYDRAULIC ASSEMBLY PRESSES has been developed and standardized by *Colonial Broach Company*, Box 37, Harper Station, Detroit 13. These machines incorporate advanced features of design especially suited to press assembly work, and are now available in capacities of 15, 20, 35 and 50 tons.



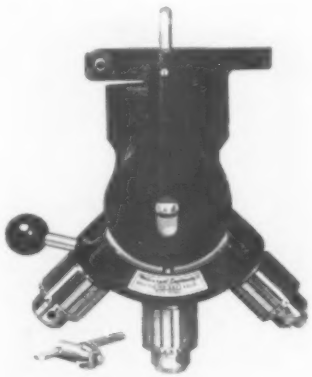
Normal ram speed, on the power stroke, ranges from 180 inches per minute on the 15 ton model to 60 inches on the 50 ton, with speeds set by a speed control valve located on the right hand side. Maximum stroke on all machines is 12 inches.

"Three-Way" Bench Furnace

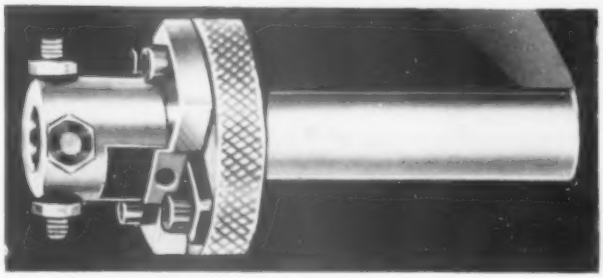
COMBINING THREE different types of furnaces in one casing, a new bench type UNIVERSAL LABORATORY FURNACE, by *Surface Combustion Company*, Toledo 1, Ohio, is especially designed for small shops and laboratories where a wide variety of parts in small lots must be heat treated. Gas fired, it functions as a direct fired oven, indirect heating muffle, gaseous atmosphere, salt or lead bath type and may also be used for melting the softer metals. Annealing, carburizing, hardening, cyaniding and tempering may be handled with or without furnace atmosphere.

Turret Head By Universal

THESE new DRILL PRESS TURRET HEADS, product of *Universal Engineering Co.*, San Diego, Cal., have been completely redesigned to give maximum rigid and accurate service. The heads incorporate semi-automatic single action indexing of the quadrant, with automatic engagement or release of the clutch mechanism controlled by the raising or lowering of the drill press feed lever. Complete information may be had from the makers, or from the general sales office at 415 Book Bldg., 1249 Washington Blvd., Detroit 26.



Precision Reamer Holder

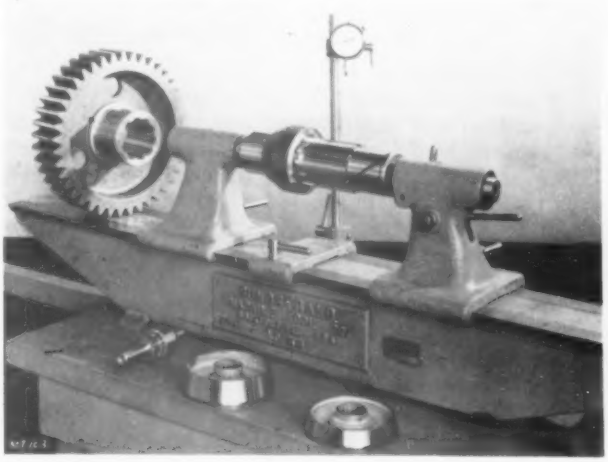


A NEW principle of true-center reaming is said to be involved in a *Precision Centering Reamer Holder* manufactured by LAVALLEE & IDE, Inc., Chicopee, Mass.

In use, the Holder is set with an indicator, establishing an absolutely true-center line which compensates for errors in chucks, turrets and even diagonal errors due to worn turret locks. Once this true center is established, reamers may be interchanged freely in any size within the capacity of the holder, without the use of bushings or adapters.

A New Spline Arbor

THE AMTEC SPLINE ARBOR, a product of *A. Mackmann Tool & Engineering Co.*, 1431 West Lake Street, Chicago 7, is a positive locking, self centering precision arbor especially suited to the turning, grinding or milling (on center) of splined gears and parts, and for inspection.



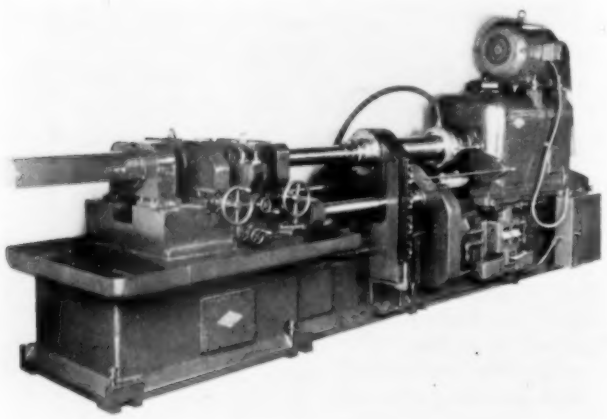
Turret Drill Head By Madco

DESIGNED to fit practically all types of medium sized drill presses having quill diameters from 1¾" to 2⅜", a line of Six Spindle Turret Attachments manufactured by *Madco Products, Inc.*, 516 5th Ave., New York 18, includes the model No. 275 illustrated. A feature of these heads is an Indexing Depth Stop, designed to control the drilling depth of each of the six spindles of the Turret Head. In operation each stop is brought into control position when its corresponding turret spindle is indexed to operation position.

Gun Carrier Boring Machine

DESIGNED AND BUILT by *Advance Tool & Die Company*, 7356 St. Aubin, Detroit 11, the hydraulically actuated machine shown cuts previous time, in boring gun carriers, to one-fourth. Of rugged construction, the machine removes one inch of metal per side, boring the carrier to 8¾" diameter.

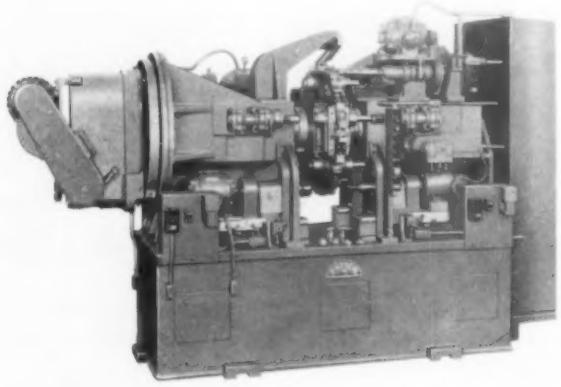
Alignment is assured by a heavy guide bar, and further provision for accuracy and sensitiveness is provided by driving the boring bar through a floating drive. In addition, a pneumatic cylinder actuates a follower bushing, for supporting the boring bar, during the cutting cycle.



Special Machine For 12 Operations

A TWO-WAY AUTOMATIC CYCLE MACHINE, designed and built by *Snyder Tool & Eng'g. Company*, 13400 E. Lafayette, Detroit 7, performs 12 distinct operations on a brass sprinkler head body. The workpiece is a brass casting without previous machining, and the machine drills, reams, hollow mills and threads on one end. On the opposite end, it hollow mills, faces, drills and taps in addition to assembling and spinning on a pressed metal deflector, of which there are three sizes and shapes.

Loading is manual, but other operations are automatic cycle, and production is at the rate of 375 units completely machined and assembled per hour.



The Largest Yet In Die Casting Machines

THE symposium on Plastics, published in the July *Tool Engineer*, and the article on Die Casting in the August issue, seem to have created rather unusual interest. In addition to many highly complimentary comments, we have received numerous inquiries, from various sections of the country, for further information on techniques of procedure, design, tools and machines.

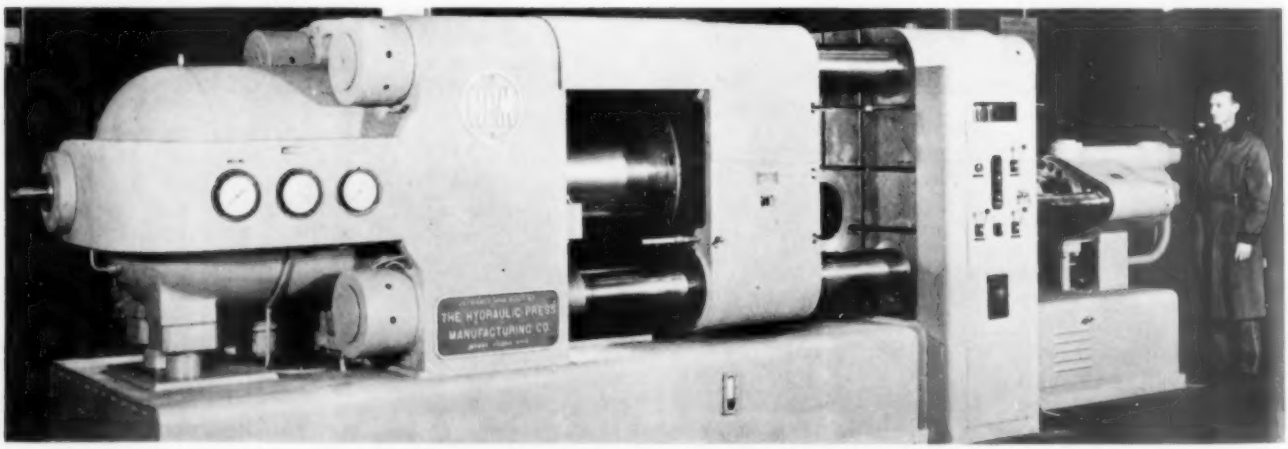
In connection with the latter, we are pleased to show, here, the latest and biggest in high pressure die casting machines. This massive, "all hydraulic" DIE CASTING MACHINE, designed and built by the *Hydraulic Press Manufacturing Co.*, Mt. Gilead, Ohio, is capable of casting 14.88 lbs. of aluminum alloy per "shot" at an injection pressure of 25,000 p.s.i. This weight represents a casting volume of 154½ cubic inches.

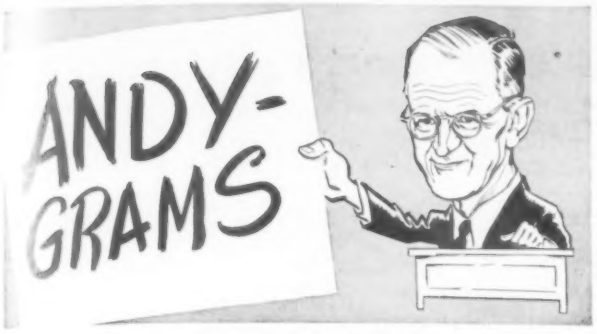
While of the same basic design as the HPM standard 400-A die casting machine, although considerably larger, this new machine portends a revolution in the production of large, light metal alloy parts. To realize its magnitude, one must compare its injection capacity—14.88 lbs.—with the 2.4 lb. injection capacity, at 25,000 p.s.i., of the largest previously existing standard high pressure machine.

However, a better idea of its capacity can be had from the following condensed specifications: Mold clamp pressure, 1,000 tons; maximum mold mounting space, 31" x 56"; maximum daylight opening between mold mounting surfaces, 48"; maximum mold clamp travel, 24", and maximum injection stroke, 18".

A majority of high pressure aluminum die castings are produced with injection pressures ranging from 10,000 to 12,000 p.s.i., and if such pressures are satisfactory for extremely large parts, it is assumed that aluminum castings of 30 lbs. or more can be produced with this revolutionary machine at these pressures. Designed to meet a demand, it is indicative of a growing trend toward injection molding.

The world's largest hydraulic Die Casting Machine, capable of casting almost 15 lbs. of aluminum alloy per "shot" at 25,000 p.s.i., is revolutionary in injection molding.





FOR THE several days that it took the Nips to make up their mind, I stalled off the deadline in hope that, once again, I could write the Column with the world at peace. Then it came—the BIG NEWS!—and with it a noise that, dinning on the ears, grew into a vast silence as a world went wild with joy. That is, that part of the world that vents its emotions in noise and rioting. But, "this too will pass away," when there will come the sober realization that the peoples of the world must unite to see that it doesn't happen again.

If this sounds preachy, it is nevertheless a case for the survival of mankind. For war has become, not so much a contest between forces of armed men as between engines of destruction that, sparing neither women nor children and razing fortress and home alike, all but out-rival the worst of Nature's cataclysms. Man must either begin to build a civilization, or be destroyed by such civilization as he has achieved.

~ ~ ~ ~

WHILE AMERICAN INDUSTRY can be justly proud of its war-time accomplishment, it can take equal pride in that far sighted leaders and key men took time to plan for the peace. Nor was this planning done at any sacrifice of war production; of that, the result is proof enough. Rather, the planning was extra work, performed on time needed for healthful recreation and, often, at risk to personal health. But because of this planning, in which a minority assumed responsibility for the welfare of the many, there will be a resurgence in the manufacture of consumer goods that should outstrip, by far, the production of prewar days. And that, in the final analysis, portends mass employment and mass prosperity.

When you get right down to it, that was what the trouble was all about—too many people worrying about how they were going to live instead of pitching in and making the living. But, the ones that started the fuss not only killed the goose that laid the golden egg but the whole flock as well. Now, they'll eat crow. Moral: Don't start what you can't finish.

~ ~ ~ ~

NOW THAT it's over, I'm going to get on the right side of Jim Donahue, our art director, and have him iron out some of the wrinkles from the cartoon he drew of me when I came on the job. Not that he didn't do his best with the material he had to work with although he might have been a bit more generous with hirsute adornment. Jealous, maybe, a/c I top him by a few hairs. At that, Jim's a right guy who, as you can see for yourself, is doing a swell job with our art work.

In this connection, every day brings letters and phone calls complimenting us on the fine job we're doing with the TOOL ENGINEER. Referring to the *Symposium on Plastics* (July issue) Edmund D. Bachand, of Springfield, Mass., wrote: "This article is one of the best I ever read, giving . . . information that I have never been able to get out of any . . . handbook. Thank you very much." You're welcome, Edmund.

Another Springfielder—William Radloff—extolls the *Fundamentals of Tool Engineering* and the article, *Hydraulic Systems applied to Machine Design* (March issue), and suggests a wider inside margin so that articles can be cut out and bound. A good idea, but one that will take some working out. Personally, I cut out articles with a razor blade, close to the binding, and then rejoin the pages with a strip of ¾" adhesive tape. A letter folder, trimmed to size and titled, serves as a binder.

Hartley W. Barclay, former editor of a national industrial magazine and now engaged in industrial sales engineering at 250 Park Ave., N.Y., wrote among other things: ". . . as a member of the A.S.T.E., I want to congratulate those responsible . . . upon the splendid editorial job that has been done since the new magazine was inaugurated . . . I have found that other tool engineers share my expression of the outstanding work that has been done by the staff of the magazine." Well, we're trying and, to judge from responses, seem to be "covering the waterfront" as far as articles are concerned.

~ ~ ~ ~

PERSONALLY, I get a big kick out of my job, although, at times, there is a wrench of heart when it comes to rejecting a release or article that doesn't fit into our editorial scheme. (Material must bear on the tools and techniques of mass production). Occasionally, however, a point is stretched, as when scientific developments portend future mass manufacture or where applications come within our field of operations.

For instance, we ran a "short"—*The Hinged Motor—it always does the right thing*—by Wm. Schaphorst in the July issue. A number of readers challenged this article yet, oddly enough, each critic presented a different version regarding the "how" of the thing. I threw it all into the lap of Mr. Schaphorst, who informs me that his version had been checked by a leading manufacturer of belted transmissions and declared okay. Diverse opinion regardless, the fact remains that the hinged motor works.

~ ~ ~ ~

A NUMBER of folks have buzzed me about this atomic bomb that shortened the war by a number of moons. Personally, I don't know the first thing about it, and while publicity releases (there's been plenty) credit various concerns with an "in", the *how* of the thing is shrouded in deep mystery. At that, I strongly suspect that several of our prominent members had a hand in its development. Tool engineers would have, you know.

Me, I "majored" in chemistry as a spare time (?) pill-roller at the old Swedish Drug Store in Providence, run by Oscar (Doc) Silvius and Karl Berg. One evening, Doc asked me to hold a test tube containing some noxious mixture. The stench almost took my breath away, and as I turned my face the mess exploded. BOOM! Doc's grin was wiped off as a splinter of glass embedded itself in his nose, and I had the last laugh digging it out.

Now, coming back to the atomic bomb, the explosive charge is made up of the comparatively inert elements of the split uranium atom and when these are reunited (more or less as Doc compounded the stuff in the test tube) the result is just something awful. But, it's been a long time in the making. Over twenty years ago, I read a novel (international intrigue and all that) in which the hero and the villain were vieing for possession of the formula for atomic energy. So, while the idea doubtless originated in the mind of a scientist, it took a writer to inspire its fruition. And what an apple it turned out to be!

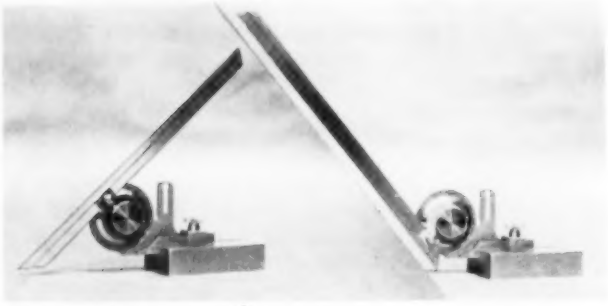
With that, I wind up my editorial job for the month—that is, all but putting the book "to bed". Then, bang into the October issue. In this job, there's no rest for the weary; you just wind up one job to start another, like a housewife washing dishes. But now, I'd like to take a few days off at some lakeside where, in peace and quiet (?), I could expand my girth to its prewar 30 inches. With rationing and all, I'm down to the last hole in my belt.

Andy

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Base For Bevel Protractor

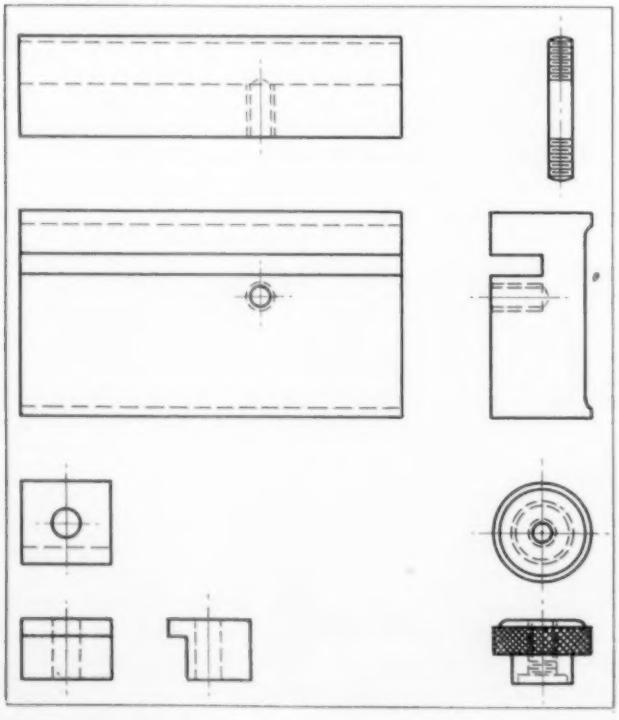


In using a bevel protractor, particularly on inspection and layout work, a good deal of time can be saved by means of a base block as illustrated. This enables one to set the protractor at any desired angle and to slide the base block and protractor against the surface being checked. This is also very useful when used with set-ups on machine tools.

A steel block is machined, shaped and slotted as shown in the line drawing, after which it is hardened and ground. The width of the slot depends upon the type protractor to be used, but it is important that the bottoms of the slot and the block be exactly parallel with each other in order that the protractor may be accurately read from the horizontal.

Prior to hardening, a small hole is drilled and tapped to accommodate the clamping stud and the clamp proper, shown in detail. Note the knurled nut, machined and shaped as shown, and used for holding the protractor in place. It is suggested that the clearance between the slot in the block and the protractor be held to within .002".

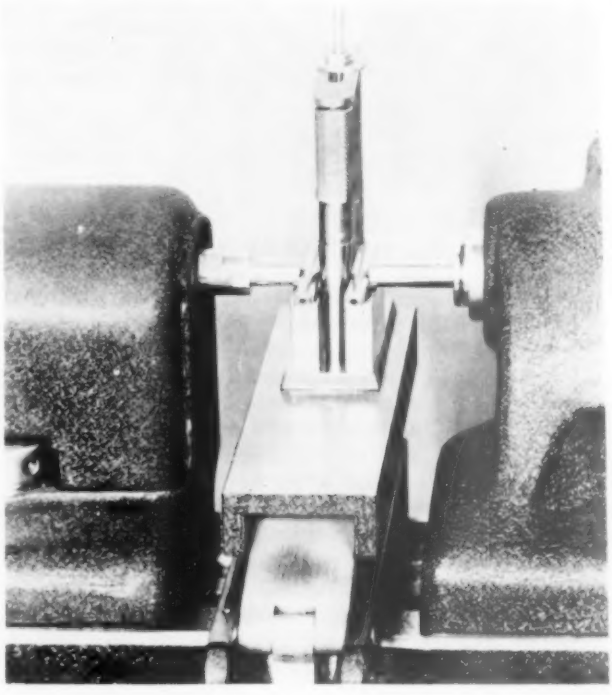
D. E. McDonald,
Northern New Jersey Chapter, A.S.T.E.



Fixture For Checking Tapers

The fixture shown, to hold tapered parts in a measuring machine, has simplified the checking of tapers per foot and eliminates the necessity of a long mathematical process for each part.

Mainly a small clamping arrangement, the fixture consists of a base with an upright block attached, and a holding clamp. The taper is placed in the fixture and securely clamped. Two identical rollers are used for measuring the diameter of the taper at the bottom. A reading is taken, and the rollers are then set on identical Jo-blocks for another diameter measurement.



The diameter of the roller, and the height the rollers are raised, has now been obtained, and the angle of taper per foot can be found in any machinist's handbook. If the values found agree with the required values, the indicator readings will show any variation in each succeeding taper.

This method of checking tapers is much easier than the conventional method which required certain variations to fit different types of shafts. The new method also checks quantities of similar parts quickly and accurately.

Adolph Pohlman
General Electric Co.,
Pittsfield Works.

Restoring Worn Oilstones

A worn or glazed oilstone may be restored by sprinkling loose emery on a flat steel plate and rubbing the stone over the abrasive. Exert a light pressure, with a rotary motion until the stone shows clean and flat all over. Use dry.

North East West South in Industry

WESTINGHOUSE ELECTRIC CORPORATION has acquired the B. F. Sturtevant Company, of Boston, according to announcement by A. W. Robertson, Chairman of the Westinghouse Electric Corp. The Sturtevant Company, with branch factories at Camden, N. J., LaSalle, Ill., Berkley, Cal., and Galt, Ont., is the largest and best known in air handling in the United States, and the uniting of the two industries is expected to result in a most complete organization in the air conditioning and air handling industry.

E. R. Haan, for nearly a quarter century technical editor of Popular Mechanics Magazine, has joined the DoAll Company as Director of Advertising, according to Leighton A. Wilkie, general manager of DoAll. During his editorship with Popular Mechanics, Mr. Haan was active in popularizing machine shop and craft work, and is largely credited with the rapid growth of the movement.

LIGHT METAL MACHINERY, Inc., with offices in the Ariel Bldg., Erie, Pa., has been organized to manufacture and distribute high production die casting machines for the fabrication of light metal parts. Machines projected for the near future include a high speed, light-weight zinc die casting machine, a new type of heavy duty die casting machine and an automatic, adjustable trimming machine for removing gates and flash from die castings.

President of the concern is Ward F. Martin, until recently in charge of die casting machine sales for the Cleveland Automatic Machine Company.

Dr. David M. Gans has been appointed technical director of the Quaker Chemical Products Corporation, Conshohocken, Pa. A specialist in colloid chemistry, Dr. Gans was on the staff of the University of Chicago, Department of Chemistry, until '35, coincidentally engaging in chemical consulting. He has also done considerable research in other fields, notably in spectroscopy and in atom smashing.

PARAGON SPRING COMPANY, with plant and offices at 4615-17 West Fulton St., Chicago, has been organized by Harry C. Faust and Christie W. Hohe. Latest type of automatic equipment has been installed, and the company offers a complete service in springs up to 2½" diameter bar. Both men were previously connected with Chicago Coil Spring Co., Mr. Faust as Chief Engineer and Metallurgist, and Mr. Hohe as general factory superintendent.

Two promotions of top personnel, at Reliance Electric & Engineering Co., Cleveland, have been announced by James W. Corey, president. These include **Fred E. Harrel,** previously chief engineer who succeeds S. B. Taylor as works manager, and **Wm. R. Hough,** product development engineer who succeeds Mr. Harrell (photo) as chief engineer. Mr. Taylor has resigned as vice president, but will remain as a director.

The appointment of **Edward B. McEntee** as representative in the mid-west area has been announced by *Machinery*, published by the Industrial Press. Mr. McEntee is well known among A.S.T.E. members in the Ohio and Michigan areas.

GRINDERS & FIXTURES, Inc., Cleveland, of which Geo. G. Auer is president, has acquired all manufacturing rights to the two principal products—the Circular Relief Grinder and Universal Indexing Head—of Cleveland Tool Engineering Co. C. E. Walling, former owner of the latter concern, has joined G & F and will be in charge of experimental and development work.

Richard O. Loengard has been appointed president, and Theodore G. Coyle and Hugh D. McLeese vice presidents, of United Chromium, Inc. Well known in the electroplating and metal finishing industry, the three men have been connected with the company since its inception. Coincidentally, Kevie W. Schwartz resigned as vice president, but will be available to the company as consultant on patent matters.

As announced by Harvey B. Wallace, president, the **WHEEL TRUEING COMPANY,** Detroit, has acquired, by purchase, the Adamant Tool Company of Bloomfield, N. J. The amalgamation of the two organizations, whose respective personnels will remain intact, is said to bring together some of the best resources in the diamond tool field.

A. R. Zapp has been appointed carbide products manager of Firth-Sterling Steel Company. A graduate of Franklin and Marshall College, Mr. Zapp studied advanced engineering at Annapolis and Stevens Institute and later was consulting engineer on power plant design and installations. With Union Wire Die Co. before joining Firth-Sterling, he became one of the pioneers in the use of carbide for drawing dies before its introduction to the American trade for cutting tools.

Foster R. Woodward, recently welding engineer with Westinghouse Electric Manufacturing Company, has joined Progressive Welder Company, Detroit, as welding applications engineer. Mr. Woodward, who was associated with the Federal Machine & Welder Co. before joining Westinghouse, is author of numerous articles on welding techniques.

ALLEN TOOL & MFG. COMPANY, Dayton, Ohio, has purchased the tool business of The Rieger Mfg. Co., Miamisburg, Ohio. The successors will continue the manufacture and sale of Rieger Multifacers, Circle Cutters, Spindle Stops, and Die Holders in addition to their regular line of custom-built tools, dies, jigs, gages and fixtures.

CERTIFIED ALLOY VALVE COMPANY has been formed, with P. C. Shaffer as chief engineer, as a new division of the Cooper Foundry Company of Hillsdale, N.J. The division will specialize in the manufacture of stainless steel valves for which it will furnish certified analysis of every part that comes in contact with liquid. Products will be sold through Cooper.

The **AMERICAN FOUNDRYMEN'S ASSOCIATION** will hold its 50th Anniversary Convention and Exhibit in the Cleveland Auditorium, next May. Coupled with this announcement is the intention to stage an International Foundry Congress. Interest has already been expressed by British and French foundry associations, the latter having been revived since the end of the European war in June.

The second Annual Southern California **INDUSTRIAL EXPOSITION** is being held Sept. 1 to 9, in the Pan-Pacific Auditorium, Los Angeles, California. Everett H. Burnside is managing Director. We are given to understand that Art Denis, A.S.T.E. Director, will be among tool engineers acting as judges of awards.

GOOD READING

A Guide to Significant Books and Articles of Interest in the Trade Press

THE SECOND ANNUAL DIE CASTING AWARD has been announced by *Die Casting Magazine*, with cash prizes for designs that, in the opinion of the judges, show greatest usefulness and originality in product and design. The purpose of the contest is to encourage application of die casting, and it is open to engineers, designers and die makers of any company except commercial die casters. For details and entry forms, write to Award Editor, Die Casting Magazine, 812 Huron Rd., Cleveland 15.

MAKING TORSION-BAR SPRINGS, an article by Charles O. Herb in August *Machinery*, is timely and interesting in view of the trend toward torsion bar springing for trucks and passenger vehicles.

FABRICATING STEEL TUBING, by C. E. Booth in August *Industrial Aviation*, deals with method improvements in fabricating aircraft structures brought about by new machines and techniques of manufacture.

"HAYNES STELLITE METAL CUTTING TOOLS," issued by Haynes Stellite Company, Kokomo, Indiana, describes the Stellite high-production metal cutting tools in addition to recommendations for cutting angles and speeds and feeds for the cutting of various metals. Recommendations are also made for paper grinding, brazing and silver soldering techniques.

HIGH SPEED MILLING WITH CARBIDE TOOLS, an article by Fred M. Burt in August *Modern Machine Shop*, is a realistic approach toward high speed milling operations and gives helpful pointers in the use of carbide-tipped milling cutters.

MICHIGAN TOOL COMPANY, 7171 E. McNichols Rd., Detroit 12, has issued a new and enlarged edition of its *Booklet of Tables* for computing change gears for hobbing machines for helical gears. The booklet is replete with useful information on gear calculation as well as on cutting speeds and feeds for gears of various materials.

AMERICAN SWISS FILE & TOOL CO., Elizabeth 1, N.J. has issued a new catalog of American Swiss *Milled Curved-Tooth Files*. All types of these files are shown, together with handy holders for rigid as well as flexible curved files.

Several inquiries have come in regarding cost of the General Electric *Industrial Electronics Course*, announced in the August TOOL ENGINEER. We are informed that the price of the complete course—(12 slide films and records, 25 sets of 12 review books, 1 instructor's guide, and carrying case) is $100.

PRACTICAL DESIGN FOR WELDING, Vol. 3, by Robert E. Kinkead, is now available. Published by the Hobart Brothers Company, Troy, Ohio, this third and final volume expands on the "idea stimulators" of the previous volumes and presents three lines of thought of particular interest to welding designers and fabricators. Cloth bound, the 200 page book sells for $3.50, or the three volumes for $10.00.

"WHERE DO WE GO FROM HERE?" is a booklet (No. E6085-A) recently published by *Allis-Chalmers Mfg. Co.*, 569, Milwaukee 1, outlining a complete engineering graduate training course permitting exploration, by the graduate engineer, of production, sales, research, design, field work, administration and many other elements of industrial operation. The Allis-Chalmers program of graduate study was recently inaugurated in cooperation with the Illinois Institute of Technology, and involves professional and technical education leading to a master's degree.

SANDING AND FINISHING, an 84-page book by the Carborundum Company, Niagara Falls, N.Y., is available to all bona fide industrial users of coated abrasives. In addition to other useful information, the book includes complete explanation of the new system and new End Use names for all coated abrasive products.

"DETROIT" THREAD MILLING CUTTERS are described in a pleasing 2-color bulletin (No. CB-45) by Detroit Tap & Tool Company, 8432 Butler Ave., Detroit 11. Size and type ranges of these standard cutters now includes practically any type of thread milling cutter, including Buttress and Modified Whitworth, in external and internal.

AMERICAN CYANAMID COMPANY, 30 Rockefeller Plaza, New York, has issued an interesting booklet, in color, describing the many applications of the chemical *Melamine*, which was mentioned in the "Symposium on Plastics" in the July *Tool Engineer*. The booklet fully describes this chemical and its important applications in Plastics.

THE HOGGSON & PETTIS MFG. CO., New Haven 7, Ct., has issued a new catalog covering its various lines of punches, marking stamps, rubber molds and tools, and laboratory equipment.

WAGNER ELECTRIC CORPORATION, 6400 Plymouth Ave., St. Louis 14, Mo., has issued a 16-page folder (form GU-86) describing its line of electrical and automotive products, motors, transformers, industrial brakes and controls, hydraulic and air brakes, tachographs and brake-service tools. Also included are addresses of Wagner's 29 sales and service offices.

THE RIGHT TOOLS
For Your Metal Cutting Jobs

Drills • Counterbores
Reamers • End Mills

Whatever your metal cutting problem, there is a National tool to do the job. National makes a complete range of high speed twist drills, reamers, counterbores, and end mills—as well as hobs and milling cutters. Every tool is designed and built to give uniform high performance and long life under hard usage.

Call Your
DISTRIBUTOR!

Leading distributors in every section of the country have stocks of National Cutting Tools. Every National distributor offers factory trained engineers to serve you. Call your National distributor for cutting tools or any staple industrial product.

NATIONAL

NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH. U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

TWIST DRILL AND TOOL COMPANY

DETROIT AND ROCHESTER, MICHIGAN

Tap and Die Division—Winter Brothers Co., Wrentham, Mass.

Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

New England

CENTERS AND REAMERS

USE CARBIDE TIPS TO INCREASE PRODUCTION AND REDUCE COSTS

★ FINELY FINISHED
★ ATTRACTIVELY BOXED
★ STOCKED BY DEALERS

In terms of pieces produced, there is nothing as economical as tools and wear parts tipped with tungsten carbide —especially when these tools and parts are of New England quality.

CENTERS . . . New England centers are tipped with a generous piece of carbide—they are ground so smoothly that friction is practically eliminated—they give outstanding service over long periods. Write for folder which gives dimensions and prices on the complete line of Morse, Brown & Sharpe, and Jarno taper centers.

REAMERS . . . New England reamers are available for 3/16" to 1½" in diameter with straight or taper shanks. All tips are brazed on *to stay*—flutes and shanks are hardened to assure longest life. You can expect more holes per grind because of the superior finish which is the hallmark of all New England tools. The latest folder gives sizes, prices, and other details. Write for your copy.

Also a complete line of mirror finished, carbide tipped, standard lathe tools and special tools of every kind.

NEW ENGLAND CARBIDE TOOL CO., Inc.

60 BROOKLINE ST., CAMBRIDGE 39, MASSACHUSETTS

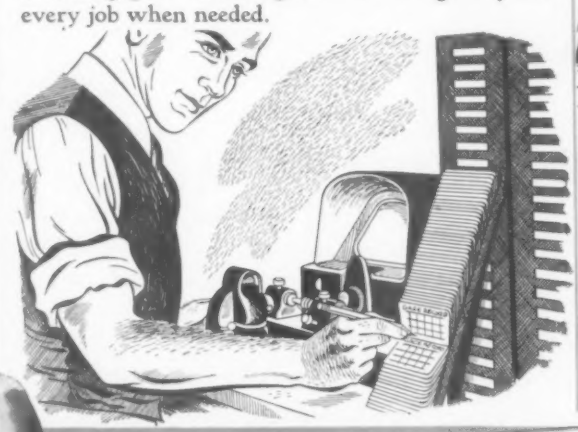
"GREENFIELD MAN" SHOWS HOW GOOD GAGING CAN PRODUCE BETTER THREADING RESULTS

[A GTD SHOW-HOW REPORT]

1 While making a routine tap service call on the "X" Company, a "Greenfield Man" noted that rejects of threaded parts seemed far above normal. Checking further, he found that these parts were gaged only once . . . at final inspection. The gages themselves were "pick-ups" of various makes.

2 The "Greenfield Man" asked permission to call in another "Greenfield Man" who was a specialist in quality control. The customer readily agreed. This "Greenfield" engineer made a thorough study and report on the plant's threading operations from a gaging point of view.

3 The "Greenfield" experts' recommendations were accepted and a complete gaging system installed. Gages were provided for checking size at each key point in the production cycle of the part. Equipment was purchased for checking the gages themselves, and an accounting system installed that insured gages in working condition being ready for every job when needed.



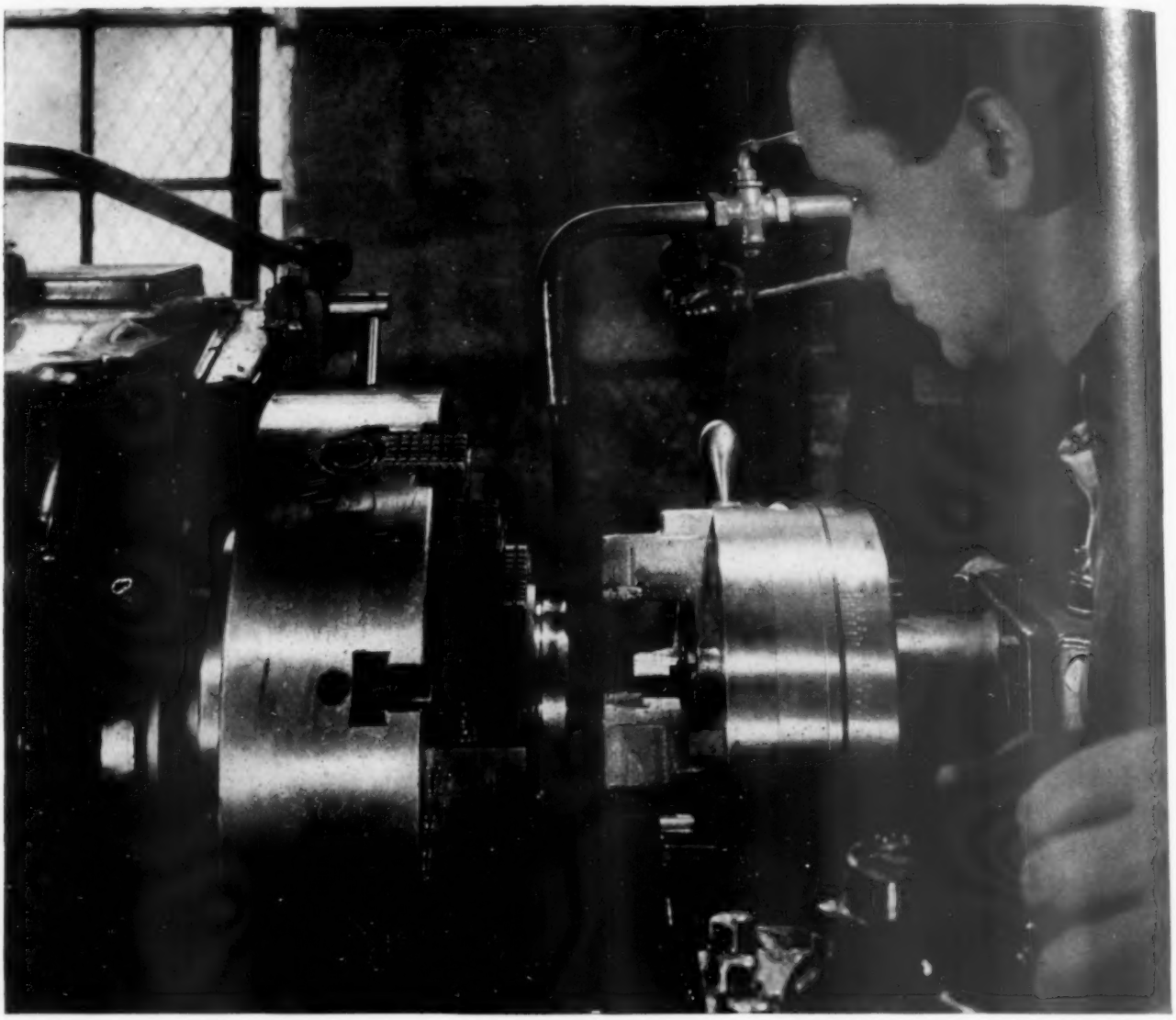
4 Finally at "Greenfield's" suggestion, modern methods for storing, protecting and distributing gages were adopted.

Results!

Through the "know-how" and initiative of a "Greenfield Man" making a routine service call, this firm was able to obtain a complete system of quality control that cut costs, speeded production and reduced spoilage. It shows how "Greenfield", leading maker of both threading tools and gages, can provide a DOUBLE-BARRELLED service to metal-working plants through its country-wide staff of field engineers.

ON THREADING PROBLEMS SIMPLY CALL YOUR "GREENFIELD MAN" THROUGH YOUR "GREENFIELD" DISTRIBUTOR!

GREENFIELD TAP and DIE CORPORATION
GREENFIELD · MASSACHUSETTS



30% Lower Threading Costs with Landmatic Heads

Cost figures show that LANDMATIC HEADS — in thousands of plants — on innumerable types of threading operations — are doing a BETTER — LOWER COST job.

The performance of these Heads in threading Valve Seat Rings for an eastern manufacturer is an example of LANDMATIC HEAD economy. Threads ranging from 1½" to 5" in diameter, 14 and 11½ threads per inch, are cut with Landmatic Heat Treated Heads at an average saving of 30% over methods previously used.

Would you be interested in seeing if substantial economies might likewise be possible in your Turret Lathe operations through use of Landmatic Heads?

Bulletin F-90 will give you detailed information

LANDIS MACHINE COMPANY, WAYNESBORO, PENNA, U.S.A.

THREAD CUTTING MACHINES • DIE HEADS • COLLAPSIBLE TAPS • THREAD GRINDERS

FIND OUT before ASSEMBLY whether gears are NOISY.

Gears must be quiet in operation . . . and the time to find out whether they are quiet or not is before they have been assembled. Testing gears before they have been assembled eliminates the necessity of tearing down and rebuilding.

The Red Ring Gear Sound Tester gives you this information quickly and if the gears tested are noisy, it gives you the information necessary to correct the trouble.

One of this machine's principal characteristics is a sound chamber and acoustical horn which amplifies gear noises 50 times. Gears up to 18" O.D. may be run under brake load and center distance setting may be made to precision gage block accuracy.

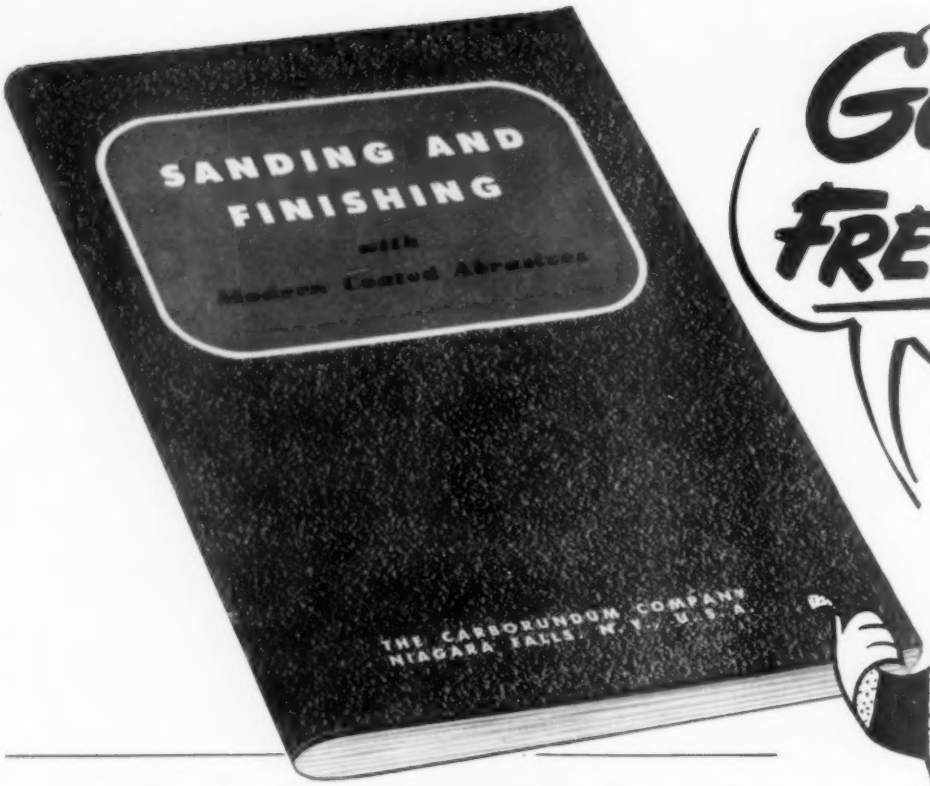
Write for descriptive bulletin

RED RING PRODUCTS

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICH.

SPECIALISTS IN SPUR AND HELICAL INVOLUTE GEAR PRACTICE
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS



GOT YOUR FREE COPY?

AVAILABLE TO ALL BONA FIDE MANUFACTURING PLANTS TELLS HOW EASY IT IS TO IDENTIFY, SPECIFY AND ORDER COATED ABRASIVES BY "CARBORUNDUM"

IT illustrates the markings for Coated Abrasives by "CARBORUNDUM." How these products are easily *identified* by end use... *clearly marked* with the specifications on both package labels and backing material . . . *easy to order* because you know exactly what you are using.

In addition this new book gives you information you will find helpful concerning Coated Abrasives by "CARBORUNDUM" and their wide range of uses. If you have not yet received your copy, be sure to write us today. The Carborundum Company, Niagara Falls, New York.

ABRASIVE TOOLS FOR METALWORKING

METAL CLOTH . . . SANDER DISCS . . . INDUSTRIAL CLOTH . . . POLISHING PAPER . . . CROCUS CLOTH . . . WATERPROOF PAPER . . . SLEEVES . . . CARTRIDGE ROLLS . . . SLOTTED DISCS . . . CLOTH DISCS . . . CONES . . . CRANKSHAFT ROLLS . . . "ECONOMY" ROLLS . . . EMERY CLOTH . . . INDUSTRIAL CLOTH BELTS

HERE'S WHAT'S IN IT!

1. Sanding and Finishing Processes.
2. Abrasive Grains.
3. Classification of Grain Sizes.
4. Bonding Materials.
5. Coatings.
6. Backing Materials.
7. Flexing.
8. Suggestions for stocking.
9. How to identify and specify Coated Abrasive Products by "CARBORUNDUM."
10. Recommendations for Belt Splices.
11. Machine specifications for Belt Sanding.
12. Specifications for Standard Coated Abrasive Products.

THERE IS A PRODUCT BY

CARBORUNDUM

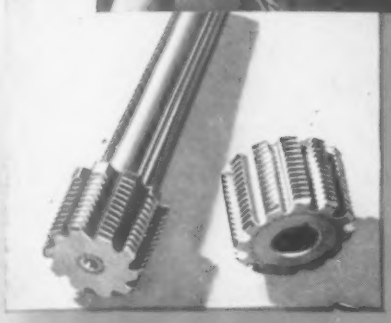
TRADE MARK

FOR EVERY ABRASIVE APPLICATION

("CARBORUNDUM" is a registered trade mark of and indicates manufacture by The Carborundum Company)

Do it with DALZEN

Left: Dalzen taps, in U. S., Metric, Whitworth, and Special forms are precision ground of hardened high speed steel in a complete size range. TUNGSTEN CARBIDE TAPS — EITHER SOLID OR INSERT—A SPECIALTY.



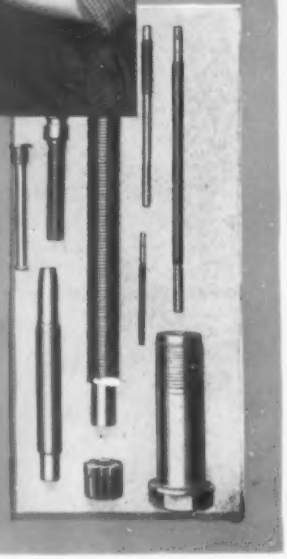
Left: High speed ground thread milling cutters, scientifically heat treated for longer cutting life.

Dalzen manufactures an extensive line of precision cutting tools, parts, thread grinding and special machines — engineered for maximum efficiency and economical operation. Each is the result of years of experience on the part of designers and craftsmen. These are reasons why, all over the United States and in many foreign countries, master mechanics who have used and worked with Dalzen-made machines and tools say, "You can do it better with Dalzen." Write for details on how Dalzen can "do it better" for you.

Below: Dalzen "2-in-1" combines a dependable, accurate center lapping machine with a sturdy drill press. Saves on equipment costs, floor space.

Below: No. 5 *Electronic* Thread Grinder. Easy to operate. High production efficiency and accuracy by controlled wheel speed, motor driven dresser, automatic compensation and other features.

Right: No. 2 Thread Grinder. Compact, upright design saves floor space. Simple to operate. Low first and maintenance cost. Ideal for short or production runs.



Right: Threaded parts are ground to close tolerances exactly to your specifications. Rigid inspection standards assure a uniform fine finish. Jobs requiring rolled or cut threads are also handled.

DALZEN

TOOL AND MANUFACTURING CO.

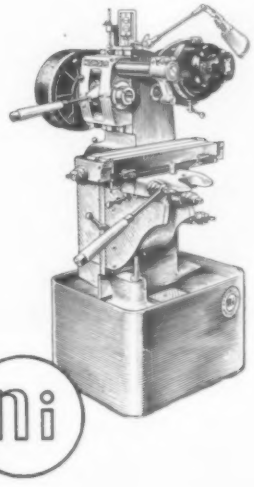
12255 EAST EIGHT MILE ROAD • DETROIT 5, MICH.

Calling SURGERY

The second Nichols Miller ever made was "Called by Surgery," and is still on the job producing surgical instruments.

The production of surgical instruments demands accuracy, fine finish and the ability to machine unusual forms. The Nichols Miller is designed for such work. Contour milling is done easily with the rise-and-fall spindle. The Nichols can do conventional milling, grinding, turning and boring just as easily—any job within its capacity requiring tolerances to "tenths."

Your products may not be surgical instruments, but your problems in production are the same. A Nichols Miller is the answer.



This new catalog on the Nichols Miller is free for the asking.

THE *Nichols* MILLER

MANUFACTURED BY W. H. NICHOLS & SONS, WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS: NICHOLS-MORRIS CORP., 46 CHURCH ST., NEW YORK 7, N. Y.

This huge marine cargo drive is typical of the unusual machining and assembly jobs that are handled every day at Warren City. One of the best-equipped heavy steel fabricating plants in the world, Warren City's facilities include more than 600 separate pieces of large-capacity equipment. These include planers, shapers, milling machines, lathes, boring mills, drills, cranes, automatic welders, grinders, flame cutting machines, stress-relieving furnaces, and extensive facilities for X-ray and other types of testing. Send for our illustrated brochure, "Men, Machines and Management for Heavy-Industry Jobs," with complete listing of the facilities and equipment in our huge plant at Warren, Ohio. Located in the heart of the Cleveland-Pittsburgh industrial area, Warren is on main or connecting lines of four major railroads.

NEED A LIFT ON YOUR HEAVY STUFF?

IF IT'S STEEL—and you can *move* it—we can make it! Our seven-million-dollar plant in eastern Ohio is one of the most modern and complete shops in America for the fabricating, welding, machining and assembling of heavy machinery, parts and equipment. Our experience in the advanced welding techniques which have been developed during the war has already proved highly valuable to our customers. Our ability to re-design heavy steel castings into practical modern weldments has effected great savings in weight, bulk and cost, in addition to substantial gains in strength, production speed, freedom from flaws, and ease of testing. If you have a problem that weldments might solve, or a heavy job of any kind that your own plant is not now in position to handle, put the matter up to our staff of practical-minded engineers. They'll gladly study your needs and give you their recommendations, without obligating you in any way.

WARREN CITY MANUFACTURING COMPANY ★★★

DEPARTMENT H

WARREN, OHIO

Wholly Owned Subsidiary of

GRAHAM-PAIGE MOTORS CORPORATION

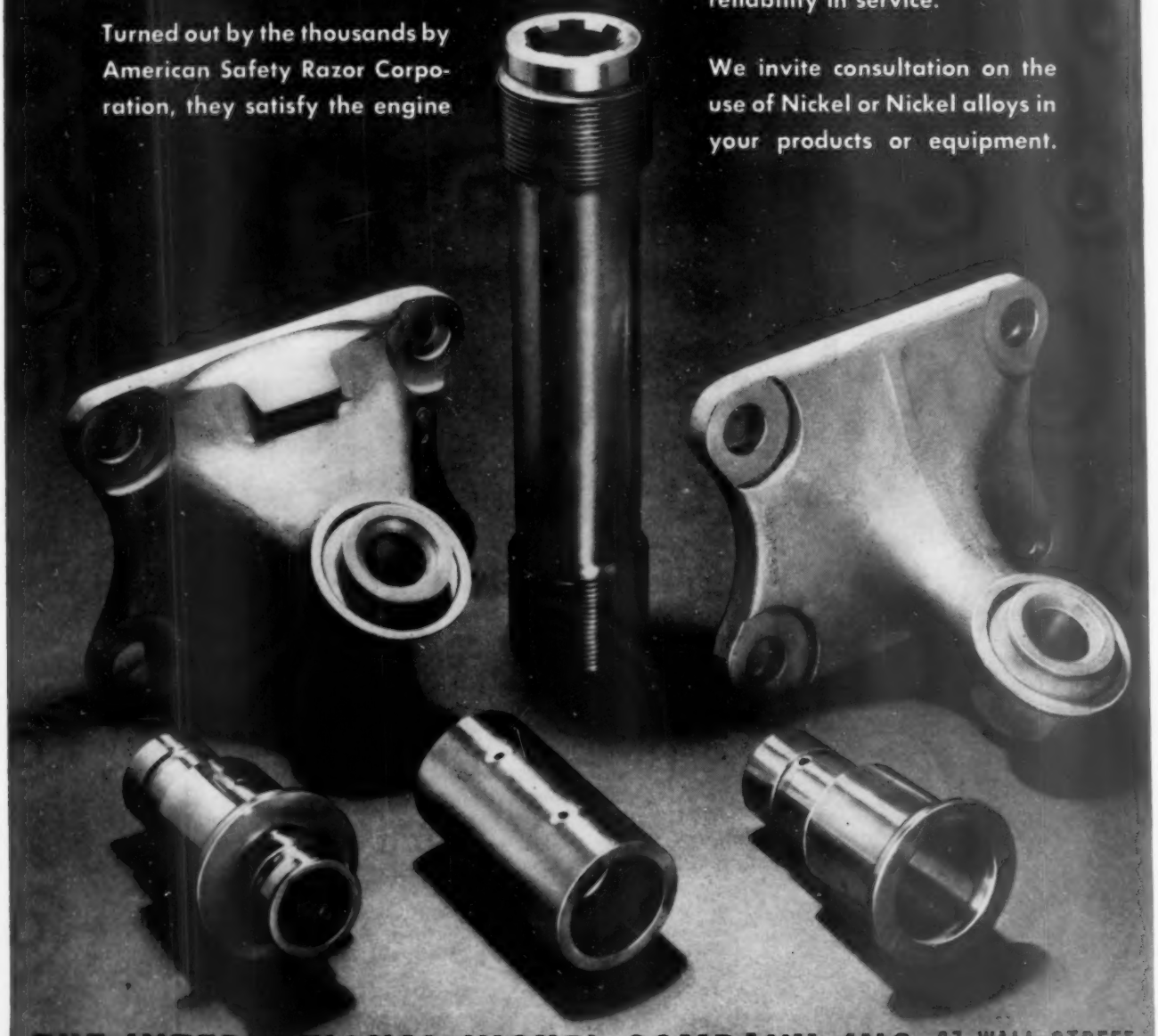
NICKEL ALLOY STEELS

Provide Essential Dependability

These Nickel steel parts for aircraft engines meet the rigid requirements and specifications of the Army Air Forces.

Turned out by the thousands by American Safety Razor Corporation, they satisfy the engine builders' demands for high mechanical properties, minimum distortion after heat treatment, close tolerances and thorough reliability in service.

We invite consultation on the use of Nickel or Nickel alloys in your products or equipment.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

CHICAGO CUT-OFF WHEELS

From the swift era of war production comes another modern miracle, the cut-off wheel—man power and man hour saver—for the fastest, smoothest method of cutting tubing, wire, steel and brass sheets, glass, porcelain, Stellite, tungsten, plastics, laminates and other hard-to-slice materials.

When RT, the special formula bond was developed, it put the cool-running CHICAGOS 'way out in front in real performance records.

Available in rubber or resinoid—a full range of styles and sizes. 3 bond types—for every operation.

WANT TO TRY ONE? Tell us what you have to cut, grinder you use and size wheel you'd like. We'll send a test wheel promptly. *Write for Circular.*

CHICAGO WHEEL & MFG. CO.

Originators of the famous Chicago Soft Rubber Polishing Wheels

1101 W. Monroe St., Dept TE, Chicago 7, Illinois

MADE WITH RT

THE NEW BOND THAT HOLDS ITS OWN . . . GIVES ONLY WHEN IT MUST!

Send CIRCULAR____ SEND TEST WHEEL____ SIZE____ TO CUT____

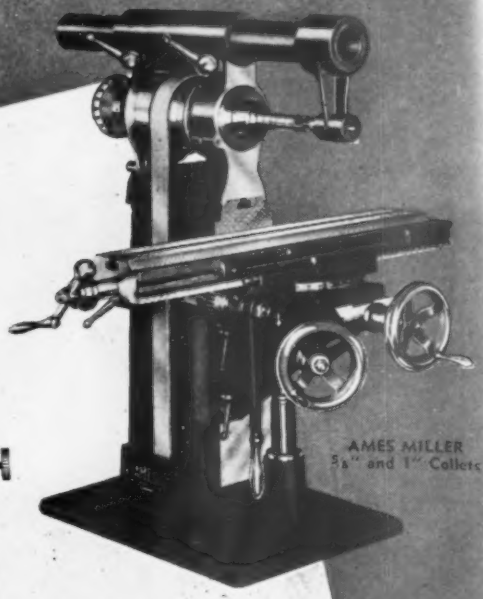
NAME _____

ADDRESS _____

CITY _____ STATE _____ TE

AMEs

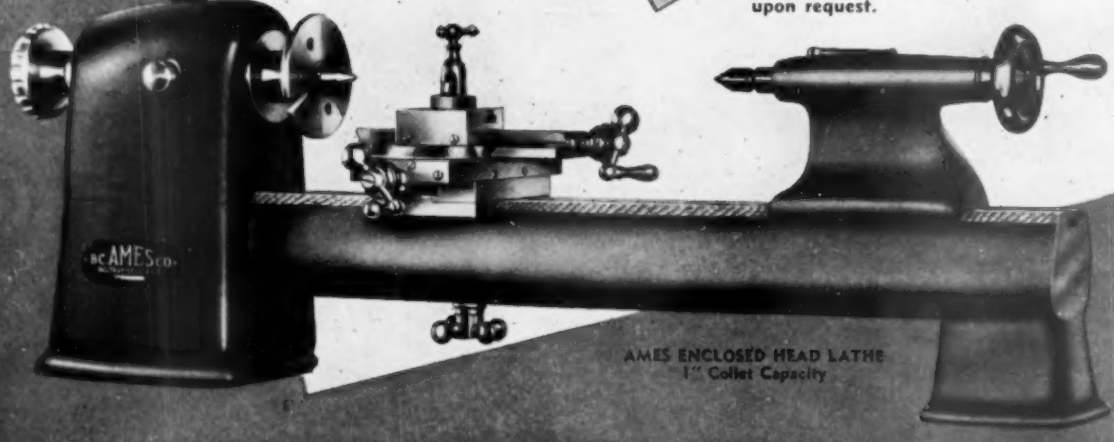
RHODES SHAPER
7" Stroke



AMES MILLER
5/8" and 1" Collets

for PRECISION and PRODUCTION EFFICIENCY

Engineering experience, high-grade craftsmanship, quality of materials and ease of maintenance assure maximum accuracy and durability for all Ames bench type machine tools. Ames machines are high standard for toolroom, laboratory and instrument manufacture . . . are equipped with tooling that is flexible and adaptable to high production . . . have easy speed selection over a wide range. Specification booklets will be sent upon request.



AMES ENCLOSED HEAD LATHE
1" Collet Capacity

B. C. AMES CO. WALTHAM 54, MASSACHUSETTS

MANUFACTURERS OF QUALITY DIAL INDICATORS AND GAUGES

In the streamlined conversion of American facilities to war products, stampings played a major part. In reconversion to civilian production they will play a similar part.

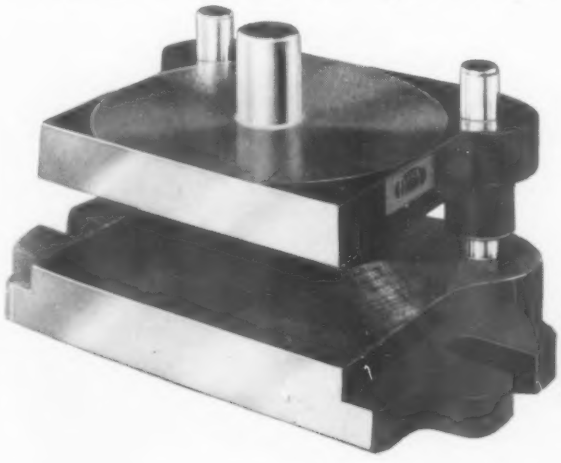
No other machine equals the Press for speed, quantity and accuracy of production. No other Die Set equals the DANLY PRECISION DIE SET for speeding Die-Making-Programs—and Press Production.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue, Chicago 50, Illinois

DANLY
National Assembly

Call Danly

- **MILWAUKEE 2** — *111 East Wisconsin*
- **DETROIT 16** — *1549 Temple Avenue*
- **CLEVELAND 14** — *1550 East 33rd Street*
- **DAYTON 2** — *990 East Monument*
- **ROCHESTER 4** — *16 Commercial Street*
- **PHILADELPHIA 40** — *3858 Pulaski Avenue*
- **LONG ISLAND CITY 1** — *47-28 37th Street*
- **DUCOMMUN METALS & SUPPLY CO.** — *4890 South Alameda, Los Angeles*



DIE MAKERS SUPPLIES
DANLY DIE SETS
Welded Steel Fabrication

PLANNING FOR RECONVERSION ?

Then you'll want this "KIT OF FACTS"

on

BETHLEHEM'S BIG 8 TOOL STEELS

Reconversion talk is in the air. Talk of retooling—and that will mean thousands and thousands of jobs for the Big 8 Tool Steels.

The Big 8 are probably old friends of yours. But in planning for reconversion, you'll want information that will be useful during the change-over period.

You can get it by writing for the Big 8 "kit"—eight individual booklets crammed with basic facts on these versatile tool steels. For your convenience, the booklets are mailed as a set in a durable, handsome container: one you'll be glad to keep on your desk.

Bethlehem's Big 8 are suitable for more than 90 per cent of your tool-steel jobs. You'll find many of these jobs listed in the eight booklets—together with a wealth of facts on other pertinent items. Ask for your set *today*.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Bethlehem Steel Export Corporation, New York City

★ BETHLEHEM STEEL ★

FREE

A request on your company letterhead brings you the kit post-haste. Here's what you'll find inside:

Uses of each steel

Instructions for heat-treating

Analyses

Discussions of critical points, hardening, impact tests, etc.

Graphs of tensile properties

Tables, micrographs, and other illustrations

Carbon Tool Steel
(water-hardening)

Tool Room (BTR)
(oil-hardening)

Omega
(maximum shock-resistance, cold work)

No. 67 Chisel
(high shock-resistance, both hot and cold work)

Air-Hardening
(low distortion during heat-treatment)

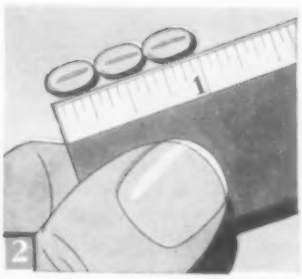
Lehigh Die & Tool, H Temper
(high-production die steel)

No. 57 Hot Work
(maximum red-hardness in hot work)

No. 66 High Speed
(general-purpose high-speed steel)

What's a cubit? Ask any old Egyptian!

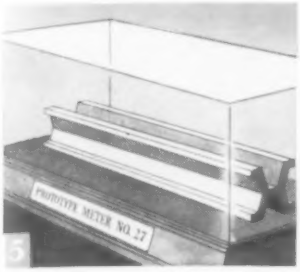
Egyptians measured by *cubit*—length of a human forearm.



In 1324, England figured three barley corns made a fair *inch.*

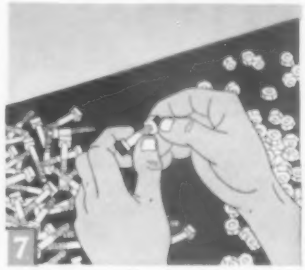
In 1500, the left feet of any 16 Englishmen totaled a *rod.*

From King's nose to fingertips was a *yard* in medieval France.

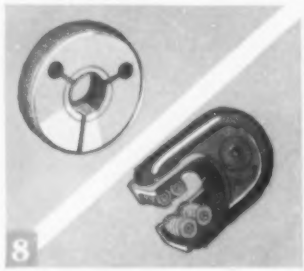


In 1875, the *meter* was adopted to aid standardized production.

Next came *master gages* for closer dimensional control.



By 1930, *gage* accuracy made parts fully interchangeable.



Ring type gages are accurate; Roll Snap Gages speedier.

Woodworth's LIMITROL Gage combines best features of both.

Inexperienced inspectors use it with speed and accuracy.

If a part passes the LIMITROL, it will assemble.

Industry lauds LIMITROL'S accuracy and high capacity.

What Woodworth Accuracy Means to Production

WOODWORTH, to industry, is another name for *precision*—precision gages, precision tools, precision machined parts.

There is a reason for this.

Every Woodworth product must conform to the basic policy of this company . . . *to make only products which will benefit industry through increased production and reduced costs.*

This means that the great demand for Woodworth Tools and Gages will be continuing, especially in view of the coming battle for postwar markets.

And it means that Woodworth engineers have been charged with the responsibility of searching constantly for new ways to speed up and lower the cost of production, in connection with Woodworth products of the future.

The constant growth and expansion of the N. A. Woodworth Company is due to strict adherence to these objectives.

ACCURACY YOU W CAN TRUST

WOODWORTH

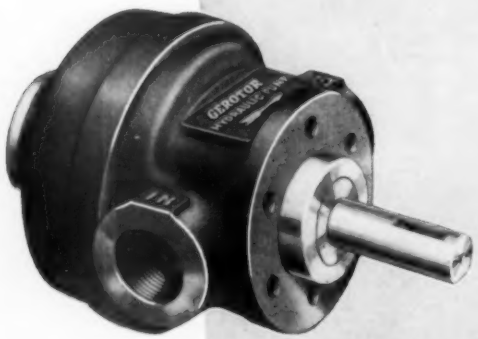
N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD, DETROIT 20, MICHIGAN

PRECISION GAGES

PRECISION MACHINED PARTS

PRECISION TOOLS

VERSATILITY + DEPENDABILITY = ACCEPTABILITY!



SINGLE UNIT MODEL

DOUBLE UNIT MODEL

One of the reasons for Gerotor's steady acceptance by manufacturers of machinery is the unusual versatility of Gerotor Hydraulic pumps. Such a reputation must be earned —and Gerotor has demonstrated its versatility by its adoption as standard equipment on a wide variety of nationally known machinery for both war and post-war uses.

If you have a tough pump problem, why not let the Gerotor Engineering Staff help you solve it.

GEROTOR

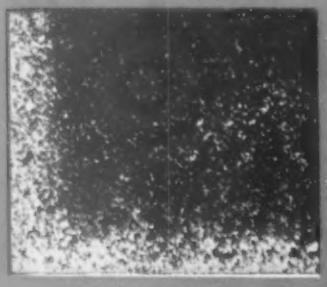
HYDRAULIC PUMPS

GEROTOR MAY CORPORATION · BALTIMORE, MD. — LOGANSPORT, IND.

You Should Know About Park Protective Coatings for Steel

NO-CARB

For the prevention of carburization or decarburization. Applied by brushing or spraying on clean metal surfaces. It is not recommended for threaded work nor is it designed for use in salt baths. Especially suitable for protecting the surfaces of high speed steel tools hardened from furnaces with or without atmospheric control.



Sample of carburized SAE 1015 steel, treated on top and right hand edges to prevent carburization, as compared with untreated edges.

NO-KASE

For selective carburization in liquid baths. Provides positive protection against carburization on areas that have been brushed or sprayed with it. Particularly advantageous where such difficult sections as threads are to be protected against liquid carburization. Can also be used successfully in gas or compound carburizing.

Sample of Molybdenum high speed steel, hardened after treatment of top and left hand edges with NO-CARB while other two edges are unprotected.

NO-TRIDE

For selective nitriding in ammonia atmospheres. An easy to mix, quick drying liquid paint; easily removed after nitriding by wiping or brushing.

NO-SCALE

For the prevention of excessive scaling on steel. A paste of brushing consistency for use on high alloy steels, die blocks and forgings. Acts as a die lubricant and prevents the loss of valuable alloys during heating operations. It is also used on the outside of pressed steel pots to prevent excessive oxidation. May be brushed or sprayed. Removed by mechanical working.

An example of selective carburization with NO-KASE. Note the clear cut line of demarcation between the protected and unprotected areas (treated in PARK-KASE for 3 hours at 1600 deg. F.)

CARBON PREVENTER

For the prevention of carbon penetration into steel. Used on threaded sections or other locations where No-Carb would be difficult to apply or remove. Not designed for use in salt baths.

Park

PARK CHEMICAL CO.
DETROIT . . . MICHIGAN

● Liquid and Solid Carburizers • Cyanide, Neutral and High Speed Steel Salts • Coke Lead Pot Carbon • Charcoal • No Carb • Carbon Preventer • Quenching and Tempering Oils • Drawing Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement

8074 MILITARY AVE. DETROIT 4, MICH.

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

Monarch's New 10" Hi-Speed Manufacturing Turning Machine has already demonstrated its power to save time and cut costs on quantity production of aircraft and other close-tolerance work. Write for details on how this machine can save money for you on small turning work requiring a high degree of accuracy.

THE MONARCH MACHINE TOOL CO. • SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

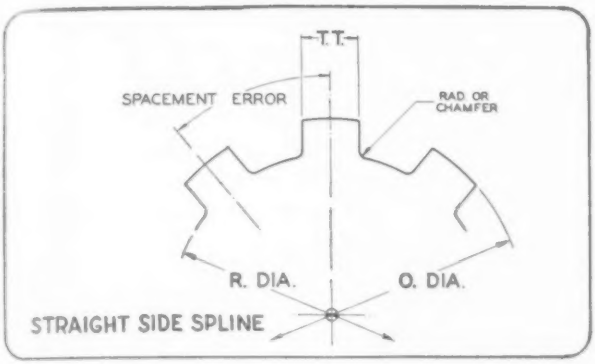
CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

PITTSBURGH 22, PENNSYLVANIA
512 Empire Building
Liberty Ave. and Stanwix St.
Phone: Atlantic 6428

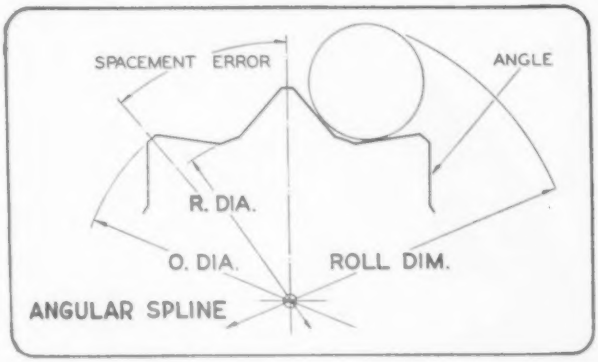
Representatives in Principal Cities

You can rely on these standard spline broach tolerances from U.S. BROACH



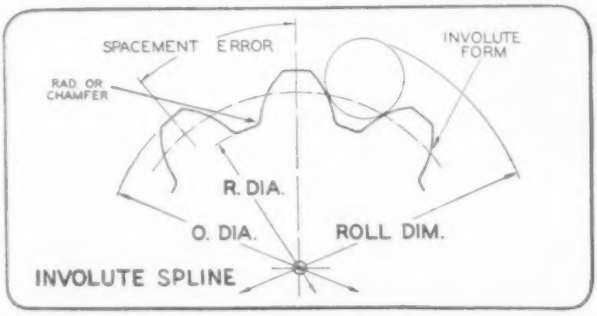
STRAIGHT SIDE SPLINE

	1" dia.	2" dia.	3" dia.
T. T.	±.0001	±.0002	±.00025
RAD. OR CHAMFER	±.002	±.002	±.002
R. DIA.	+.0 −.002	+.0 −.0025	+.0 −.005
O. DIA.	±.0001	±.00015	±.00015
SPACEMENT ERROR tooth to tooth or cumulative	±.00015	±.0002	±.00025



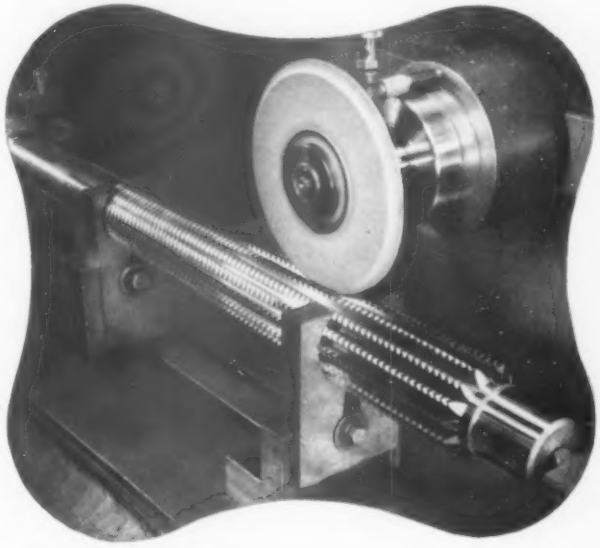
ANGULAR SPLINE

	1" dia.	2" dia.	3" dia.
ROLL DIM.	±.00025	±.00025	±.00025
ANGLE	±2′	±3′	±5′
R. DIA.	+.0 −.002	+.0 −.0025	+.0 −.005
O. DIA.	±.0001	±.00015	±.00015
SPACEMENT ERROR tooth to tooth or cumulative	±.00015	±.0002	±.00025



INVOLUTE SPLINE

	1" dia.	2" dia.	3" dia.
ROLL DIM.	±.0001	±.00015	±.0002
RAD. OR CHAMFER	±.002	±.002	±.002
INVOLUTE FORM	±.0001	±.00015	±.0002
R. DIA.	+.0 −.002	+.0 −.0025	+.0 −.005
O. DIA.	±.0001	±.00015	±.00015
SPACEMENT ERROR tooth to tooth or cumulative	±.00015	±.0002	±.00025



Above are our own standard tolerances on spline broaches, however we have made many broaches to closer tolerances.

For estimates on your broach requirements write us today.

U.S. BROACH Company

6468 E. SEVEN MILE RD. DETROIT 12, MICH.

USB

TELEPHONE TWINBROOK 1-2211

THE MIND OF THE ENGINEER IS A BUSY PLACE

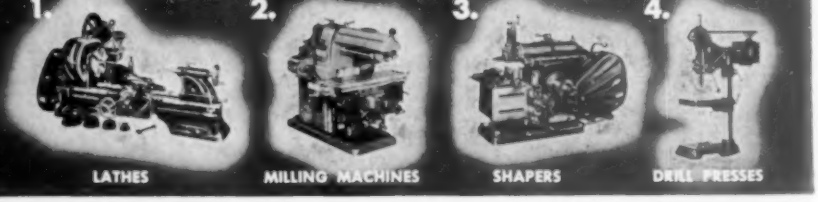
WAR LEARNED ADAPTATION KEY TO LOWER PRODUCTION COSTS

This ingenious machine was developed by the engineering staff of the Pacific Enamel Works of the American Radiator & Sanitary Corp., Richmond, Calif. It is made of 4 Atlas drill press heads for simultaneous, automatic operation. An air-operated jig positions the work in the machine, then after a timed interval air cylinders advance the drills.

The genius of American production stems from the eagerness of engineering minds to find new and better ways of doing things. Astonishing results have been obtained by coordinating the machining motions of compact precision tools with the new electric, hydraulic, and air controls and mechanisms. It opens a great new field of production possibilities — enables plant engineers to plan on lowering costs on many small part operations by building special low cost automatic machines with the Atlas 4 Tool Team. Send for other adaptation ideas and latest Atlas catalog.

ATLAS PRESS COMPANY
914 NORTH PITCHER ST., KALAMAZOO 13D, MICHIGAN

Atlas 4 TOOL TEAM FOR SMALL-PART MACHINING



TWO GUARANTEES OF

GAGE ACCURACY

A·P·I

This is the insignia of the American Petroleum Institute, which maintains the highest standards of accuracy on threads among all great industries.

Pipe Machinery is privileged to use this emblem on A.P.I. Gages, as evidence that gages bearing it are checked against master gages approved by the Federal Bureau of Standards.

PMCO

This is Pipe Machinery's own emblem of quality and accuracy.

We will not permit it to appear on any gages that do not conform, in dimension and finish, with our own established standards for the gages that are used throughout industry for quality control.

STANDARD PLUG, RING AND THREAD GAGES **are carried in stock, to meet emergency requirements over a wide range of styles, types and sizes.**

SPECIAL GAGES **are built to your specification, and we shall be glad to quote you prices and delivery dates.**

PMCO

ARMY E NAVY

The PIPE MACHINERY COMPANY Cleveland, O.

GAGES • MULTIPLE THREAD MILLING CUTTERS • SPECIAL TOOLS

BROACHING A DOVETAIL SLOT IN AN ALUMINUM RING

Every Fifteen Seconds

THIS large fixture is used with a horizontal broaching machine. The part is clamped in place and the fixture shuttles into the cutting position. When the cut is completed the table shuttles out of the cutting position and the ring indexes while the ram is returning. The complete cycle requires fifteen seconds. This fixture is adjustable for slots that are at different angles as well as rings having anywhere from 40 to 60 slots in the perimeter.

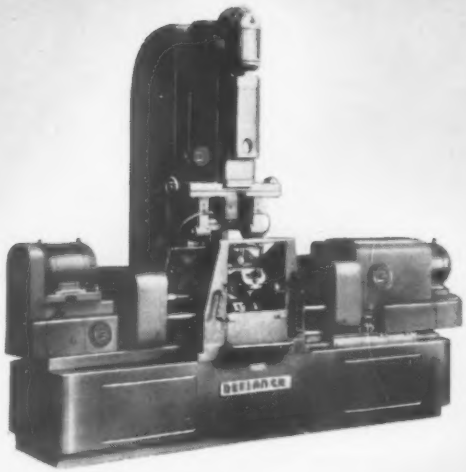
Extremely high production is only one of the features of a well designed broaching set-up. Broaching produces fine finish and close tolerances on parts of all types. Nearly every plant has several operations where broaching can combine high speed production with high quality of product at lower cost. Call in the nearest Detroit Broach representative. He will give you complete cost and production data without obligation on any operations in your plant that are adaptable to broaching.

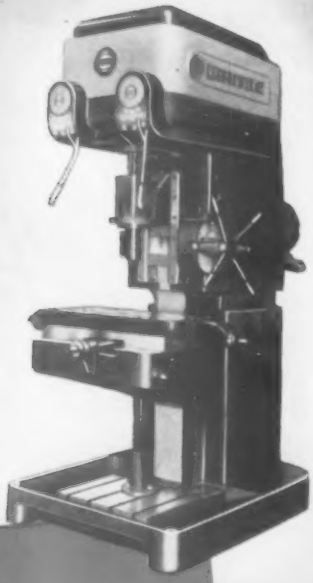
ARMY NAVY

MEMBER BROACHING TOOL INSTITUTE

DETROIT *Broach* COMPANY

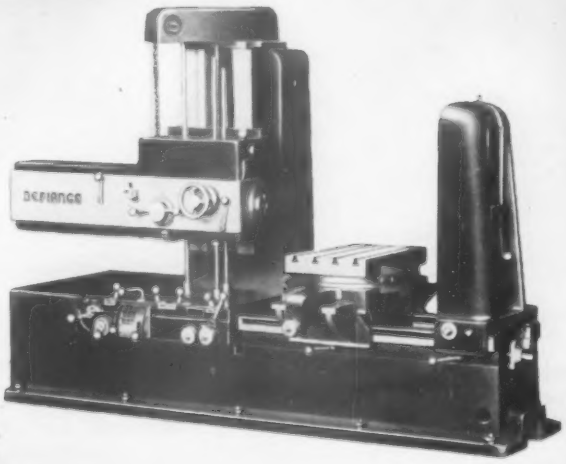
20201 SHERWOOD AVENUE • DETROIT 12, MICHIGAN





POWER geared to ACCURACY

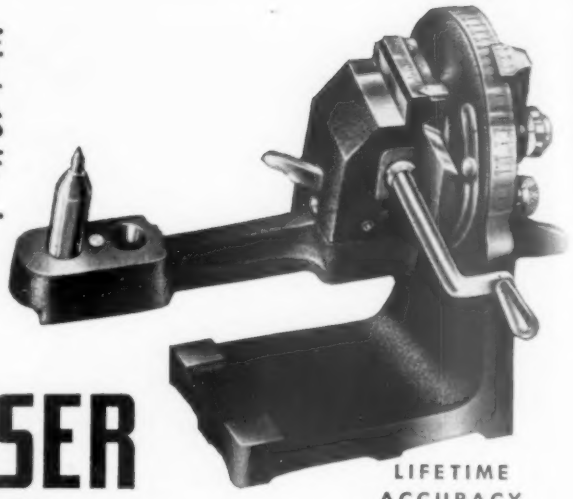
Defiance engineering leadership builds ahead-of-the-times power, accuracy and beauty in Defiance Machines! Shown here are a Defiance-built Unit Head Production Machine... Plastic Preforming Press... Quick Change Drill... and Horizontal Boring Mill. Unbeatable for accurate, low-cost, long-life operation! Write for catalog. Defiance Machine Works, Inc., Defiance, O.



DEFIANCE

BUILDERS OF PRECISION MACHINERY SINCE 1850

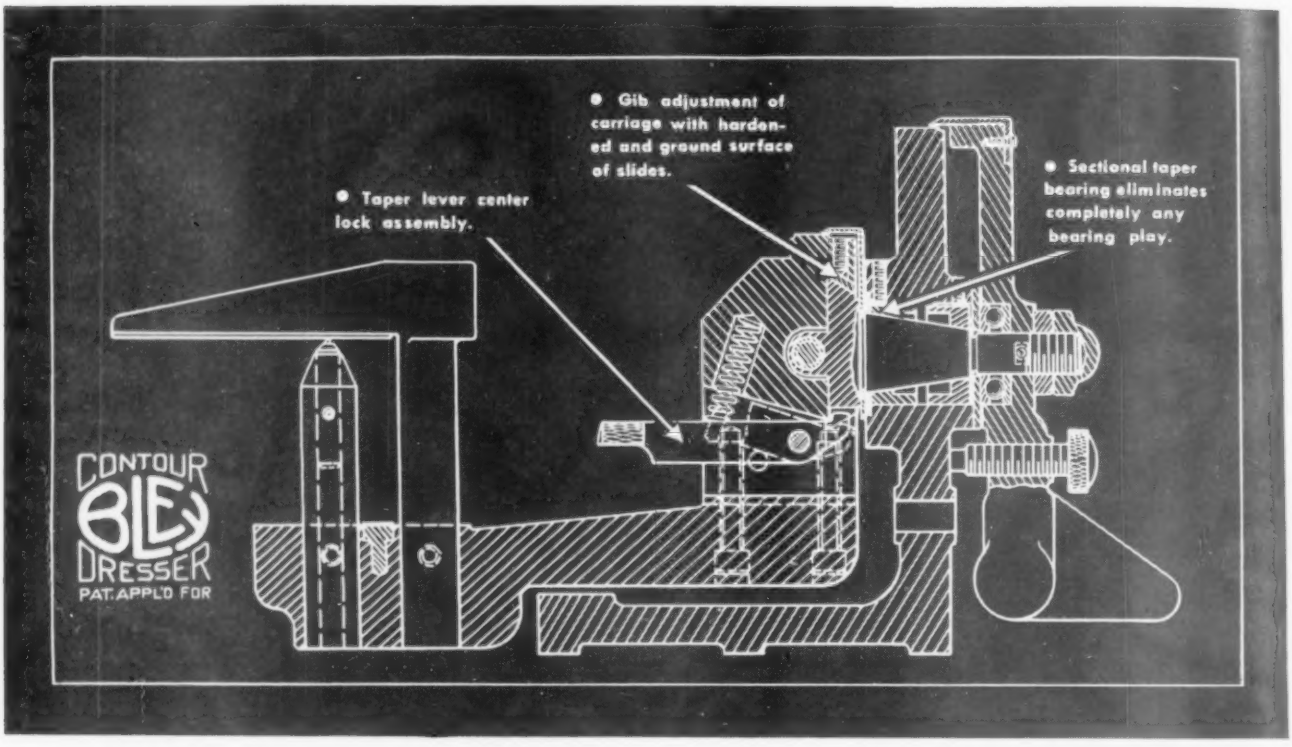
- **FOR ABSOLUTE PRECISION IN THE FORMING OF GRINDING WHEELS: ANGLES, RADII AND THEIR COMBINATIONS AND PERFECT BLENDING OF RADII WITH TANGENTS . . .**



LIFETIME ACCURACY GUARANTEED

Bley CONTOUR DRESSER

FOR SHAPING GRINDING WHEELS


• Gib adjustment of carriage with hardened and ground surface of slides.
• Taper lever center lock assembly.
• Sectional taper bearing eliminates completely any bearing play.
CONTOUR BLEY DRESSER
PAT. APPL'D FOR

Operates on a totally new and different principle! . . . Guarantees absolute precision and accuracy throughout the life of the fixture! Priced to meet the needs of the small shop—and so that purchase of several is practical for the larger shop.

1 Precision is guaranteed for the life of the fixture. Guaranteed accuracy of repeated redressing of grinding wheels at a tolerance of less than .0005.

2 Even the most complicated "setup" can be made right on the bench.

Capacity: grinding wheels up to 14" in dimater, 3" male and 3" female radii. Total of 2" lineal travel for angular work. Tangents: 1" on either side of radius.

Est. 1925

BLEY CONTOUR DRESSER
WITH 9 DIAMOND TOOLS

90° GOLCONE shaped point	$ 3.50
60° GOLCONE shaped point	4.00
CRYSTAL point	3.50
ELONGATED natural point	5.00
Rattail Tools For Semi-Circular Radii	
1/2" Rattail, radii from 0.250"	$ 7.50
1/4" Rattail, radii from 0.125"	7.50
1/8" Rattail, radii from 0.060"	5.00
3/32" Rattail, radii from 0.040"	7.25
1/16" Rattail, radii from 0.030"	8.50
	$51.75

6 EXTENSION SLEEVES and
1 RATTAIL TOOL ATTACHMENT
ALL FITTED IN FINE HINGED WOOD INSTRUMENT CASE

PRICED COMPLETE
$207.50

GOLCONDA DIAMOND PRODUCTS CORP.

3420 NORTH KNOX AVENUE • CHICAGO 41, ILLINOIS

Sound Advice
FOR YOUR
CUTTING AND FORMING
TOOL REQUIREMENTS
6·6·2
MOLYBDENUM
4.50–5.00%
TUNGSTEN
5.50–6.00%
VANADIUM
1.40–1.75%
An Excellent All-Purpose HIGH SPEED STEEL
★ TOUGH
★ WEAR-RESISTANT
★ READILY FORGED
★ EASILY MACHINED
★ WIDE HARDENING RANGE
A few of its many applications are: taps, chasers, drills, broaches, reamers, hobs, milling cutters, lathe and planer tools.
Vanadium-Alloys STEEL CO.
Latrobe, Pennsylvania
Colonial Steel Division • Anchor Drawn Steel Co.

The Best Tool Steel News of the Year!

IMPERIAL MAJOR

--the 22% TUNGSTEN--12%/13% Cobalt

High Speed Steel

—Back in STOCK at MILNE!—

FOR MANY tool-killing jobs, no substitute steel has ever matched Imperial Major, time-tested veteran of the high tungsten high-cobalt high speed steels.

HOGGING OFF metal at the heaviest cuts and feeds, Imperial Major's remarkable wear resistance and high red hardness far outstrips anything in its class.

PRODUCTION CHIEFS who knew this steel before the war – how it combined top production with tool economy – will welcome it back with immediate orders!

READY NOW, in stock, at Milne's five warehouses – in rounds, squares, flats and heat-treated tool holder bits.

FOR COMPLETE INFORMATION on Imperial Major, or other high speed, alloy, or carbon tool steels in Milne's complete line, write or phone any address below.

A. MILNE & CO.

ESTABLISHED 188?

★ NEW YORK 14
741 Washington St.

★ BOSTON 9
109 Broad St.

★ PHILADELPHIA 6
337 No. Orianna St.

★ FIVE CONVENIENT WAREHOUSES CONNECTED BY BELL SYSTEM TELETYPE

★ CHICAGO 7
17 N. May St.

★ PITTSBURGH 19
604 Frick Bldg.

WASHINGTON 4, D. C. OFFICE
900 F St., N. W.

Get it FASTER from STOCK from MILNE

KOLORKOTE
TOOL STEELS
High Speed, Alloy, and Carbon

HOLLOW, SOLID, AND AUGER
DRILL STEELS
for all mining and excavation work

BYERS GENUINE WROUGHT IRON BARS
To A.S.T.M. Specification A-189
To A.A.R. Specification M-302
To U. S. Navy Specification 46-1-7C of May 1, 1944

TIMKEN
GRAPHITIC STEELS
Machine Faster
Wear Longer

STRESSPROOF
T.M.Reg.U.S.Pat.Off.
STEEL
COLD DRAWN — FURNACE TREATED
"More than just strain-relieved."
"HIGHER IN-THE-BAR PHYSICALS"

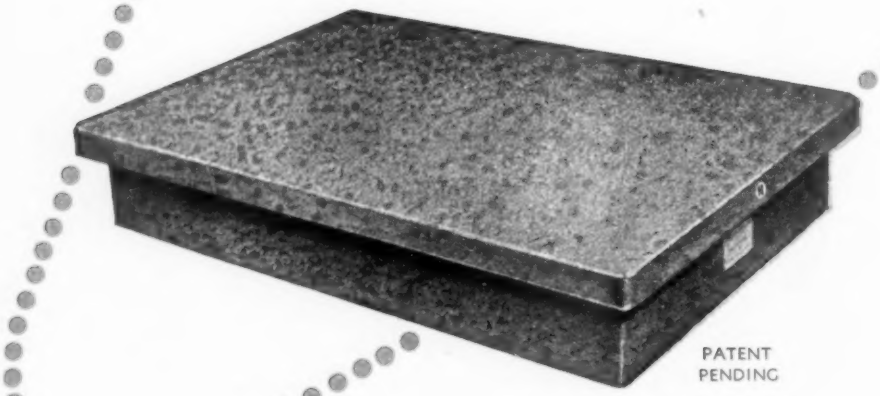
NITRALLOY TYPE G 135 MODIFIED (AIRCRAFT) TO AMS 6470-A

also carried in Warehouse Stock.

Are You Surface Grinding with Chucks?
NORTON SEGMENTS
Are Carried in Stock for All Popular Makes
YES, you can get Norton Segments right out of stock for nearly every surfacing job—in sizes and shapes for all kinds of chucks and in a wide variety of specifications: Alundum, 19 Alundum, 38 Alundum, 57 Alundum and Crystolon abrasives; Vitrified, BE Vitrified, Resinoid and Silicate bonds
OPEN STRUCTURE—Popular now for many surfacing jobs are Norton Open Structure Segments. Their large pore space means bigger chip chambers and more room for coolant—gives a faster, cooler cutting action.
There's a Norton abrasive engineer near you. Let him study your surfacing jobs and specify the segments you should have.
NORTON COMPANY, Worcester 6, Mass.
Distributors in All Principal Cities
NORTON ABRASIVES

Choose HERMAN Granite Precision SURFACE PLATES

for Economy and
1/10000 Inch Accuracy



Herman Precision Granite Surface Plates offer double economy—in first cost and in long life savings. Their original cost is no more than that of ordinary cast iron surface plates; during their long, efficient service they save their price over and over in economy on expensive "Joe blocks" and height gauges.

Unaffected by ordinary temperature, rust or corrosion, Herman Precision Granite Surface Plates are practically indestructible.

De-Magnetizing Unnecessary

Because the surface is non-magnetic, filings and emery dust are easily brushed off. The granite surface cannot become charged with metal particles.

Let us Prove our Claims

You are invited to make a shop test of Herman Precision Granite Surface Plates in your own plant under conditions as they actually exist. See for yourself the efficiency and accuracy of these hard, smooth, warp-proof plates cut from blocks of natural granite. Write today for specific data on a shop test at our expense.

Nationally Known Users of HERMAN GRANITE SURFACE PLATES

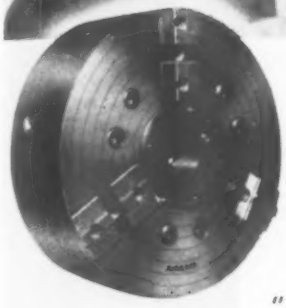
Allis-Chalmers **Chrysler Motors** **Curtiss Wright** **General Electric**
Westinghouse Electric **International Harvester**
Bendix Radio **Crosley Radio** **National Cash Register Co.** **General Motors**

Write for authoritative Government report on the use of these plates.

The Herman Stone Co.

DEPT. T, HARRIES BUILDING, DAYTON 2, OHIO

ELIMINATE SLOW, COSTLY MANUAL CHUCKING



"Chuck" High Machining Costs with AIRGRIP Chucks

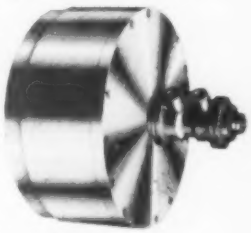
"AIRGRIP" Chucks save time otherwise spent laboriously releasing chuck by hand; reduce set-up time.

Also, "AIRGRIP'S" two-fisted action provides double gripping power...air PLUS a two-way cam-wedge action. Locks jaws mechanically when gripping externally or internally. Even if air supply fails, cam-wedge locking power holds work securely, prevents accidents.

To push output *up*...to push production costs *down*...equip your lathes with "AIRGRIP" Chucks.

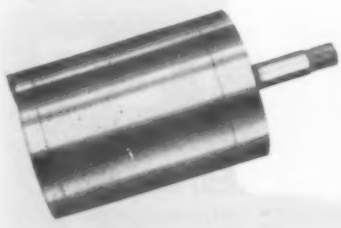
"AIRGRIP" Revolving Air Cylinders

Cut maintenance costs! "AIRGRIP" Revolving Air Cylinders operate for years without attention—wear is automatically taken up by air pressure within cylinder. No manual adjustments. Patented double ball bearings permit speed formerly impossible.



"AIRGRIP" Non-Rotating Cylinders

For controlled lift, push or pull, use "AIRGRIP" Dual-Action Non-rotating Cylinders. No skilled labor required to take apart; no tie-rods; either end of cylinder can be removed. Piston packings graphite-treated; require no adjustment; wear automatically taken up by air pressure.



OTHER ANKER-HOLTH COST REDUCERS include Air Operated Collets, Arbors, Mandrels, Drill Press Chucks, 2- and 3-Jaw Finger and Compensating Chucks, Lubricating Assemblies, 3- or 4-way Air Valves (hand or foot operated), etc. Also Hydraulic Power Units and Fittings.

Write, mentioning Products on which you desire Bulletins

ANKER-HOLTH MFG. COMPANY

2733 Connors Street Port Huron, Michigan

Representatives in all principal cities.

When buying new lathes, specify "AIRGRIP" Chucks and Cylinders 1258

If Your Tools are Recut by
EASTERN

You'll get
MORE PRODUCTION

Side Mill Converted to Special Angle Cutter

THE production you get from new tools—plus longer wear life so outstanding that it has made EASTERN CUTTER the nationwide organization to provide recutting and converting high speed tool service. Actually, EASTERN'S tool facilities are always close at hand . . . for regular sharpening service, for recutting worn high speed tools or converting them from standard to special.

Service WHEN YOU *want it*

Eastern Cutter's tool engineers are pledged to help keep your production to the maximum of efficiency . . . and EASTERN CUTTER'S plant, machinery, equipment, facilities and trained technicians makes it possible for them to provide the service you want whenever needed.

No tools of any description should be scrapped until you consult with us first.

SEND FOR OUR NEW CATALOG TODAY

EASTERN CUTTER
CORPORATION
30-32 LITTLETON AVE. NEWARK 7, NEW JERSEY

The U. S. Multi Miller

. . FOR HIGH SPEED PIERCING — BLANKING — FORMING OPERATIONS

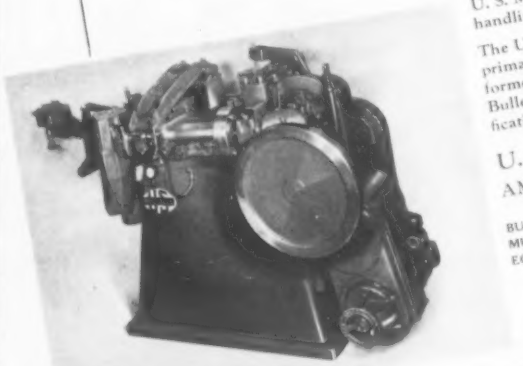
The photograph to the right, magnified 1.125 times, illustrates a formed metal stamping which is completed in one operation in the No. 28 U. S. Multi-Slide Machine from coil stock at the rate of 125 pieces per minute. The machine is arranged with two die heads. From the strip layout below, it will be observed that the die head operations are as follows:

1st Die Head — Pierce and trim.
2nd Die Head — Cup, preform and cut-off blank from strip.

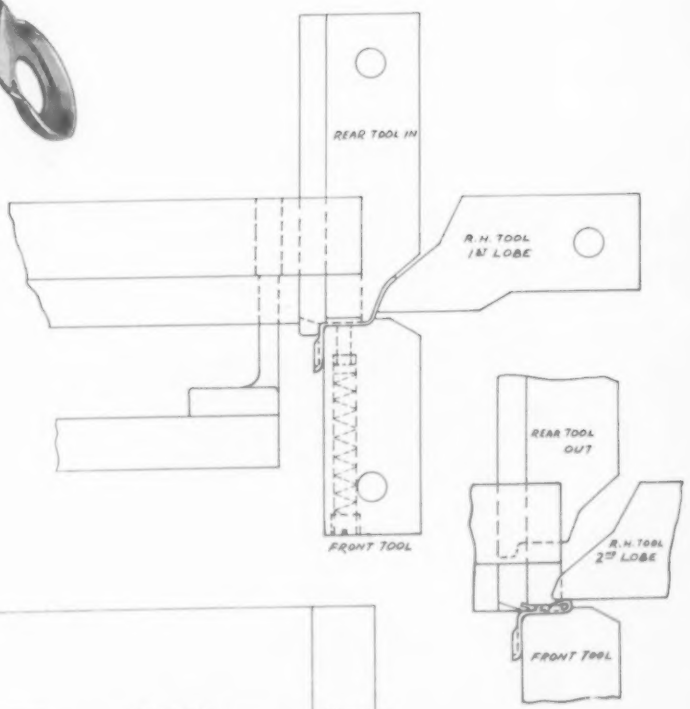
The blank is then transferred to the forming position as shown. The die heads and forming tools are all actuated by means of split type cams. In the forming position it should be noticed that the right-hand forming slide is operated by means of a two-lobe cam. In forming, the front tool enters first, followed by the rear and then the right tool. At this point the rear and right tools are withdrawn while the front tool remains in position. The second lobe on the cam, operating the right-hand slide, again advances the right tool with the front tool still in position and the rear tool withdrawn. This completes the forming and the piece is dropped from the machine.

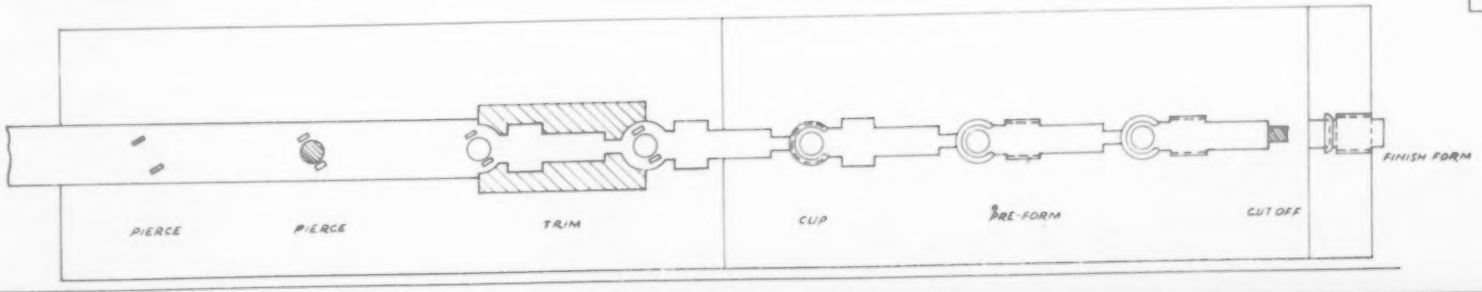
The photograph at the left shows the No. 28 U. S. Multi-Slide Machine, the size used for handling this operation.

The U. S. Multi-Slide Machines are designed primarily for the automatic production of formed metal stampings from coil stock. Bulletin No. 15T contains complete specifications. Ask for your copy.



Close-up of the formed metal part completed in one operation. Magnified 1.62 times.





U. S. TOOL COMPANY, Inc.
AMPERE (EAST ORANGE), N. J.

BUILDERS OF U. S. MULTI MILLERS—U. S. MULTI SLIDES—U. S. AUTOMATIC PRESS ROOM EQUIPMENT—U. S. DIE SETS AND ACCESSORIES

TOOLS WITH A THOUSAND USES!

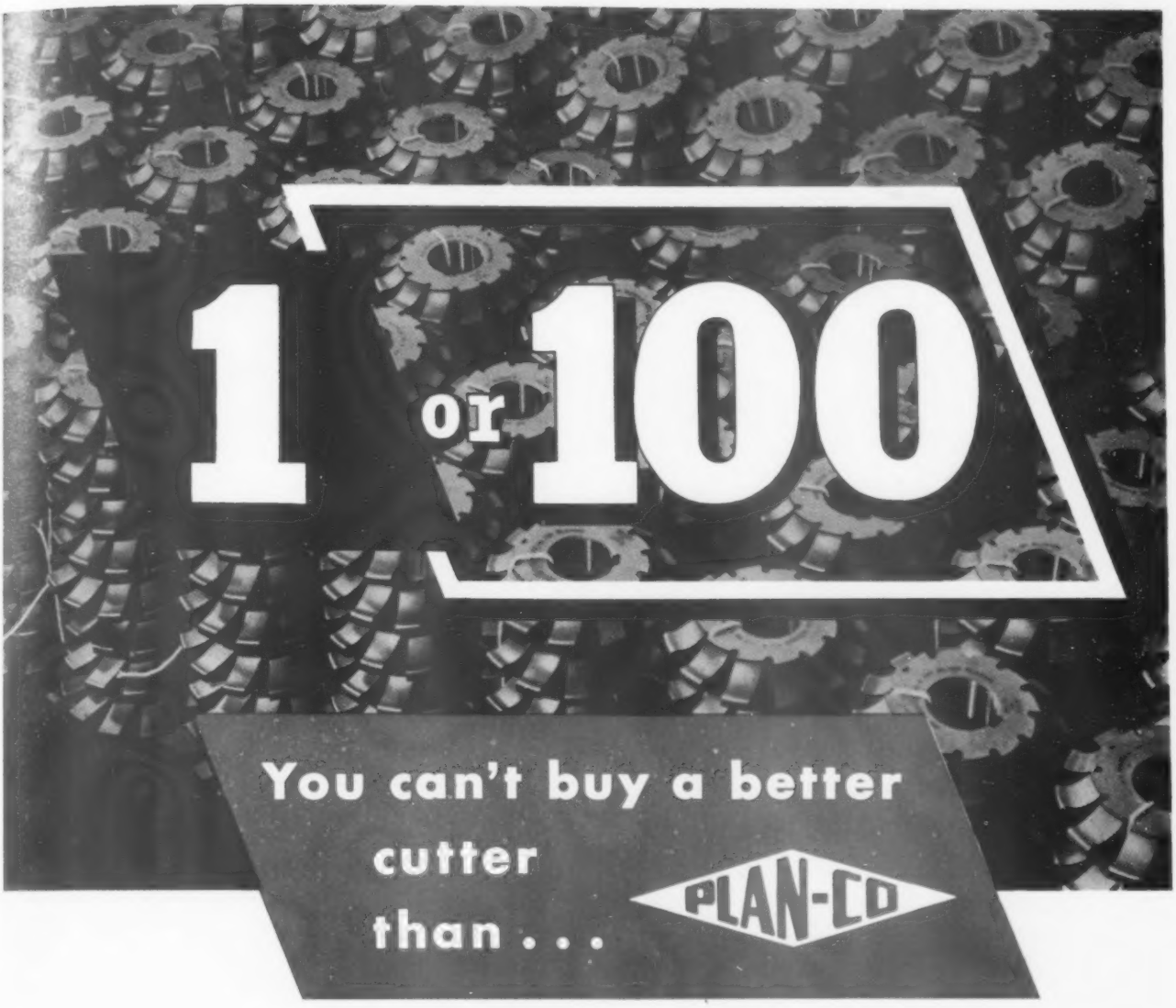
New ARO Model 3012 Impact Wrench. Lever control. ⅜" square drive with capacity for ½" bolts and nuts. Weight 1¾ lbs.

ARO

PNEUMATIC TOOLS

Now—the growing line of ARO Pneumatic Tools covers practically *every* assembly job!

This brings ARO-Engineered *accuracy, speed* and *dependability* to the whole wide range of assembly operations such as nut-setting, screw-driving, burring, filing, grinding, polishing and countless other small tool jobs. Combining stall-proof *power* with light-weight construction—these tools mean less fatigue . . . more production! In war production, ARO Tools have been used for many special jobs. They can be easily adapted to unusual requirements in your plant. Talk to your nearest ARO Field Engineer for help with your special tool problems. Write for catalog. The Aro Equipment Corporation, Bryan, Ohio.



FORM AND MULTIPLE THREAD CUTTERS, H.S.S. OR CARBIDE

Plan-Co Form and Thread Milling Cutters are the product of years of on-the-job milling experience. Made by the makers of Plan-O-Mill Form and Thread Milling Machines, they incorporate improvements developed and pioneered by Plan-O-Mill engineers.

Plan-Co Form and Thread Milling Cutters offer you: (1) Exacting accuracy and exceptional finish. (2) Increased output and longer tool life, due to greater wear resistance.

Every Plan-Co cutter is subjected to rigid inspection with modern equipment before being approved for delivery to you.

FIRSTS by PLAN-O-MILL

1. First to install General Electric's remarkable new Thy-mo-trol electric feed control!
2. First planetary to mill external threads with standard multiple thread cutter!
3. First planetary to coordinate feeds and speeds!
4. First to provide absolute control of feed-in!
5. First to offer a practical, low cost carbide thread milling cutter!

PLAN-O-MILL CORPORATION

1511 EAST EIGHT MILE ROAD

HAZEL PARK, MICHIGAN

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

THREAD AND FORM PLAN-CO MILLING CUTTERS

It Can't Happen

WITH A COVEL No. 15 SURFACE GRINDER!

Work spoilage means lost time, production, and materials. When a part reaches the surface grinding point, it invariably is 90% finished. Complete loss results should the grinding wheel DROP INTO the work. Such an accident *absolutely* cannot happen on a COVEL No. 15 because:

THE SPINDLE REMAINS STATIONARY WHILE THE WORK *MOVES UP* TO THE WHEEL

This simple but vital design feature is only one of many reasons why plant men prefer the COVEL No. 15.

Set-up on the Covel No. 15 (6" x 18") Hand Feed Surface Grinder. Spindle is stationary; table has full 11" vertical travel. Three spindle speeds make it ideal for short production runs where quick set-ups, accurate grinding of odd shaped pieces, mean reduced production costs.

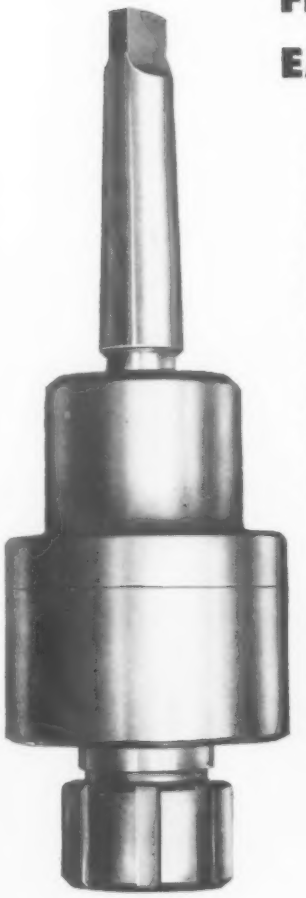
See Your Nearest Covel Dealer or Write For Bulletin T-95

GRINDING MACHINERY SINCE 1874

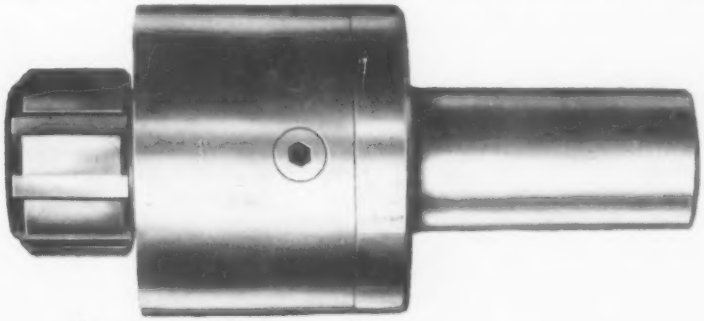
COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

NEW DESIGN OF UNIVERSAL FLOATING CHUCKS FOR BETTER BALANCE, EASIER CENTERING, SAVING IN TIME



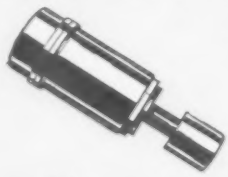
Two great advantages result from the new design of the Universal Floating Chuck. First, when the chuck is used in a horizontal position, a quick adjustment made through the flat springs counter-balances tool weight. Hence, chuck nose and tool can be brought to within a few thousandths of the center of work at high speed, saving considerable time. This quick adjustment is accomplished without restricting the floating action of the chuck. Since the frictionless bearings are radially ground in an interlocking assembly to carry both the driving and thrust load, there are no auxiliary bearings to increase friction or resistance. The second big advantage of the new Universal chuck is the seal which positively prevents the entrance of coolant into the assembly without restricting the floating action of the chuck. This means the chuck can be used at high speeds and heavy feeds where the use of coolant is required, without harming the efficiency of the mechanism. For counter drilling, reaming and counterboring round, straight, smooth holes, use the new Universal Floating Chuck—positively the most sensitive float on the market today. Write for complete information.



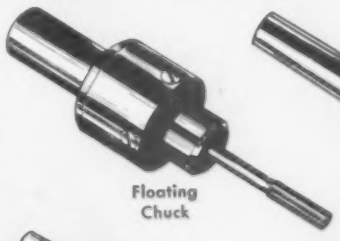
↑ FOR HORIZONTAL OPERATION

← FOR VERTICAL OPERATION

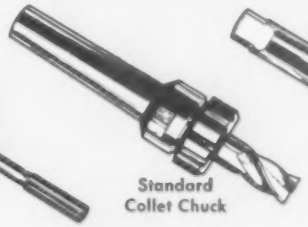
UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND ACCURACY IN YOUR PLANT



Index Plunger



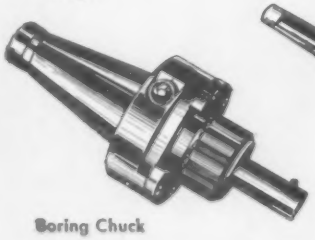
Floating Chuck



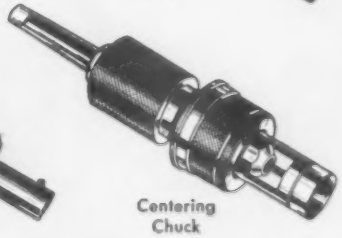
Standard Collet Chuck

Mikro-lok Boring Bar

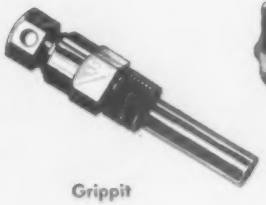
Standard Drill Bushing



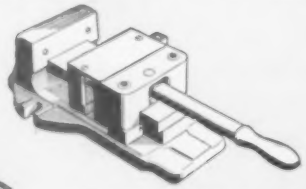
Boring Chuck



Centering Chuck



Grippit

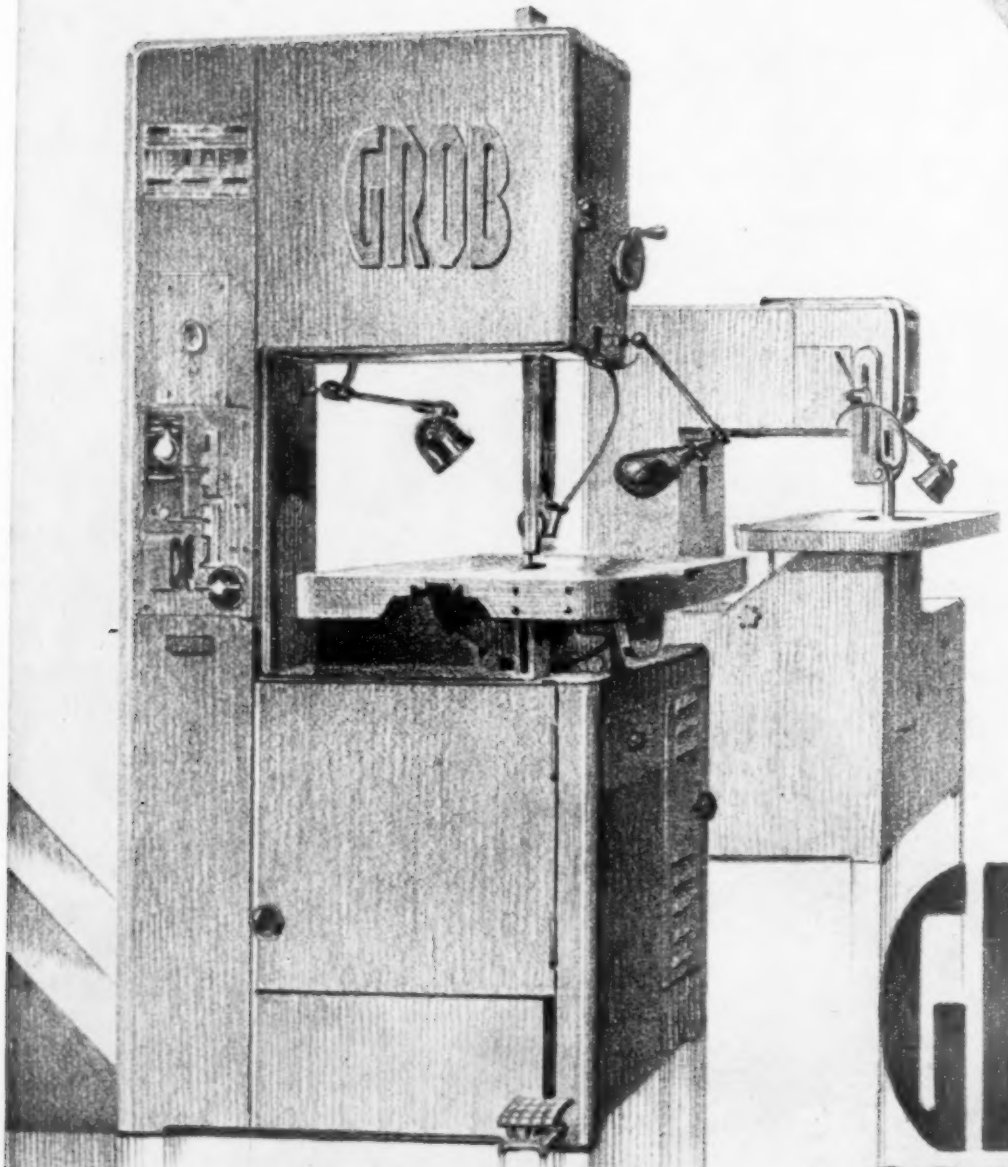


Universal Wedge-Lock Production Vise

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH, MICHIGAN — Fighter Plane Given by Employees — Employee Bond Deductions

SAWING FILING

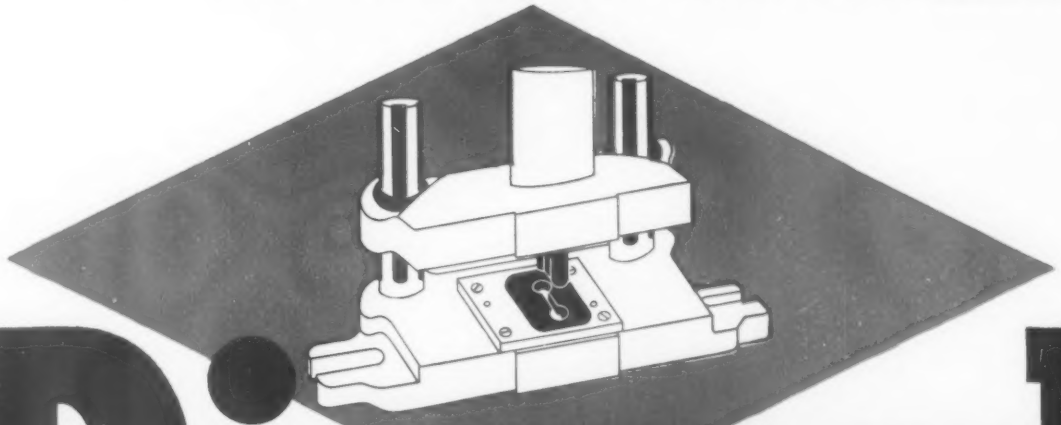


GROB BROTHERS

GRAFTON WISCONSIN

HERE IT IS *Firth-Sterling's*

original development of sintered carbide for BLANKING and FORMING dies



Diecarb

DIECARB, perfected over several years of research, trials and practical tests, is now offered to the trade for blanking die applications—a "natural" for extremely high production work, and providing extraordinarily long life between grinds.

DIECARB grades are available for blanking up to 7/16" in thickness for a variety of materials including metals, plastics, paper, etc. Performance runs have produced 10 to 1000 times the number of pieces per grind compared with former dies . . . downtime of six to eight weeks per year has been saved . . . operating costs have been lowered substantially.

If you have a blanking application now, or are planning postwar products where blanking and forming are important operations—investigate the possibilities of Diecarb.

GET IN TOUCH WITH US *Complete Diecarb Engineering Services are ready for you—die designers, brazing engineers, practical grinding men—to help you and to teach your operating personnel the fine points and short cuts of Diecarb die-making and operating.*

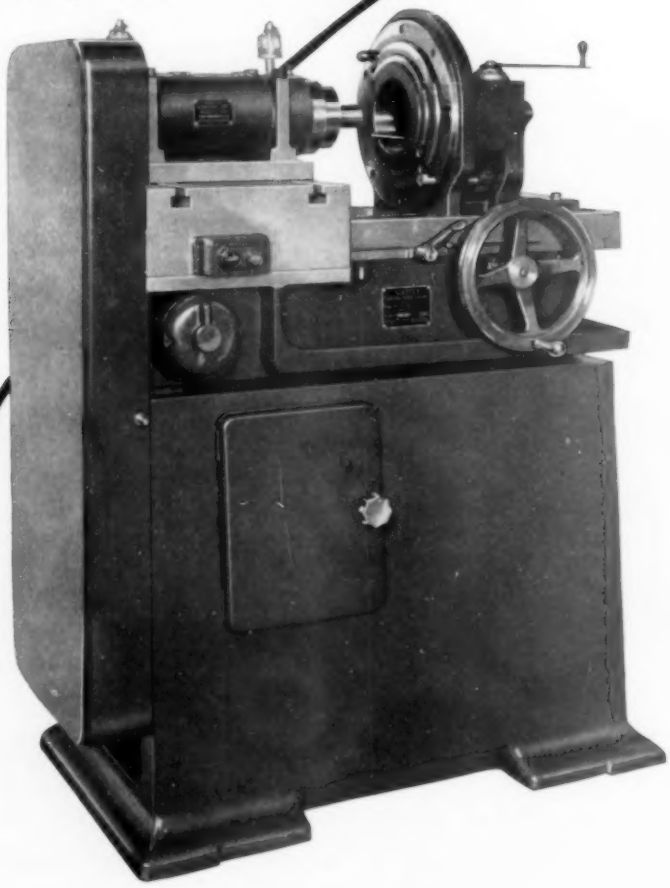
Diecarb

Firth-Sterling
STEEL COMPANY

OFFICES: McKEESPORT, PA. • NEW YORK • HARTFORD • PHILADELPHIA • PITTSBURGH • CLEVELAND • DAYTON • DETROIT • CHICAGO • LOS ANGELES

SIMPLEX

There are many simple precision boring operations best handled by a simple machine which is applicable to a variety of work and can be operated by relatively unskilled labor. This type of machine permits adjustments and maintenance by the operator thus conserving the limited supply of skilled help for those places where it is really essential. Precision is built into the machine; design of the fixture makes loading and unloading easy for the operator; investment is low justifying its use on small production quantities.



The SIMPLEX No. 2B Precision Boring Machine shown is equipped with No. 3 spindle and a multiple step locator type of fixture for mounting three sizes of motor end shields for precision boring bearing holes in accurate concentricity with the rabbet. A quick-acting clamp operates two hook bars which both seat and eject the piece mechanically so that loading and clamping is very fast and positive and ejection equally fast and positive. Micrometer eccentric adjustment of the tool makes for extreme accuracy in addition to concentricity and squareness desired.

Precision Boring Machines

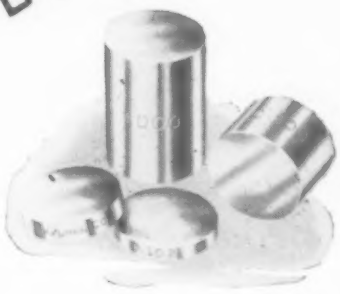
STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4528 West Mitchell Street, Milwaukee 14, Wisconsin

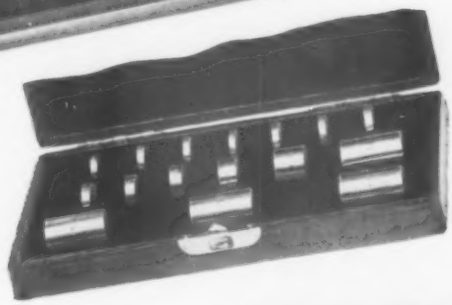
Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

Van Keuren



MICROGAGES

Set MTT MICROGAGES. 35 Gages giving 140,000 combinations. $95.00



Set MT MICROGAGES. Over 5,000 combinations in thousandths. $35.00

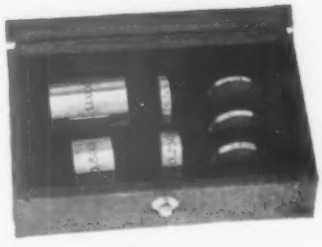
A FOUNDATION FOR ACCURACY FOR 25 YEARS

VAN KEUREN MICROGAGES are high precision working gages, designed for use on all ordinary work and economically practical for use in production because of their low cost. Their great value in general shop use lies in the fact that they enable the workman to achieve the accuracy required by the inspector.

MICROGAGES are of first quality oil hardening alloy tool steel, exceptionally hard, carefully seasoned, with accurately flat and parallel mirror-like surfaces. They combine readily by wringing together and because of their size (11/16" dia.) are ideally suited for checking heights, widths, slots, machine set-ups, gage setting and many other uses. They are made round in order to assure the best distribution of wearing surface, which is about equal to that of rectangular gage blocks.

MICROGAGES up to 1" in length have a tolerance of plus .000015" minus .000010". They average 5 millionths of an inch oversize which provides the WEAR ALLOWANCE feature of these gages.

VAN KEUREN MICROGAGES are available in sets especially designed for general shop use, for gage setting and for toolmakers and machinists. Individual MICROGAGES in standard sizes are also available in a size up to 6" in length.



Toolmakers MICROGAGE SET M64. Gives 121 combinations. $15.00

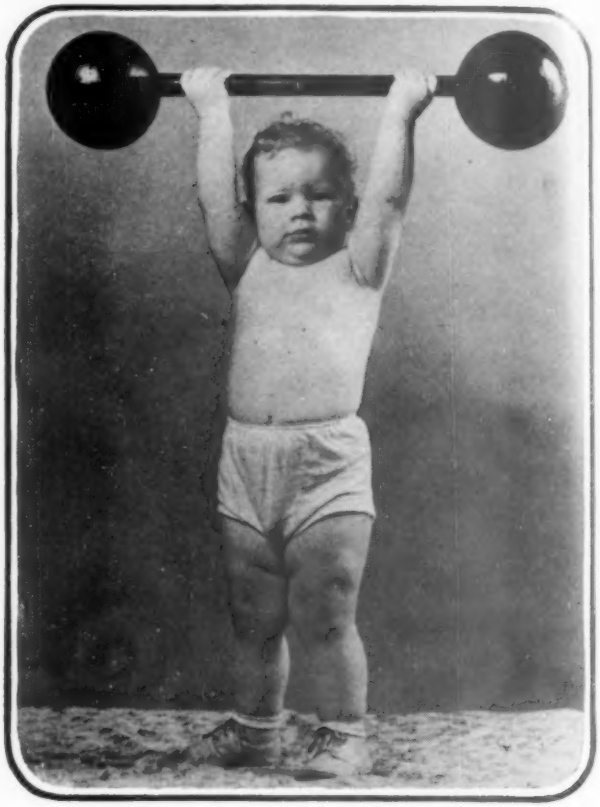
Complete details on MICRO-GAGES and the full line of Van Keuren Precision Measuring Tools are contained in Catalog No. 33, a 160-page manual for toolmakers, machinists and inspectors—sent promptly on request.

Van Keuren **CO., 176 WALTHAM ST., WATERTOWN, MASS.**

Light Wave Equipment — Light Wave Micrometers — Gage Blocks — Taper Insert Plug Gages — Wire Type Plug Gages — Measuring Wires — Thread Measuring Wires — Gear Measuring System — Shop Triangles

HARD CHROME IS HERE TO STAY • AFTER V-J DAY

Survey Proves It! Chromium is a Tough War Baby with a Future!



You will want to know the results of a survey made by Hartford Chrome, on the wartime and postwar uses of hard chrome plating. The complete story of the survey is now ready in a booklet which you will find of value. Write for it. It's yours with the compliments of Hartford Chrome, specialists in plating tools, dies, gages and molds.

Three Figures From Our Survey:

FIGURE 1 **30%**

30% of all customers surveyed had not used hard chrome plating at all before the war.

FIGURE 2 **51%**

51% either had not used it before the war, or found new uses for it during the war.

FIGURE 3 **91%**

91% will use hard chrome plating either in reconversion or regular peacetime production.

HARTFORD CHROME

CORPORATION

525 PARK STREET • HARTFORD • CONN

Licensed by United Chromium Inc.

AREA WE SERVE

WHAT IS YOUR ULTIMATE MANUFACTURING RESPONSIBILITY?

DEVELOPMENT?

ENGINEERING

SERVICE?

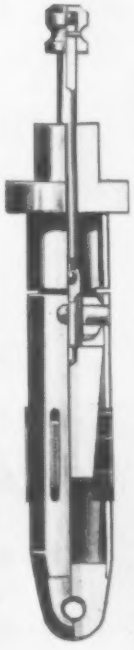
PRODUCTION?

Isn't it Distribution?

● All of the intended benefits and usefulness of your product—the brain-beating which conceived and fashioned it; the sweat, toil and risk-taking which produced it—depend upon your determination to put improved quality products into the hands of the most users at the lowest possible price. The ultimate success of your enterprise depends on balanced, economical distribution of its results.

Production economy is usually considered a necessary first step in distribution economy; and, in view of the recently increased rate of technological development, it is logical first to explore all possibilities for maintaining low unit costs of production. With probable higher labor costs ahead of us, it is evident that we can attain low production cost per man-hour only through improved machinery, improved methods of processing and improved methods of distribution.

Micromatic Microhoning—the newest desirable, high production method of final precision machining of cylinder bores—has already made substantial



improvements in quality, and cost reductions in a wide range of products in the automotive, aircraft, diesel, refrigeration, compressor, anti-friction bearings and other manufacturing industries. It can remove a large amount of metal without damaging the subsurface structure; it has eliminated one or two steps in the final processing of cylinder bores in many parts.

In this processing, a tool carrying several abrasive sticks is revolved while also being stroked in a simple or compound reciprocating motion. Applicable to internal and some external cylindrical surfaces, it removes metal at rates ranging up to .008 to .010 on diameter per minute; and in quantity up to .070 to .080 on diameter, or volume as high as 75 cubic inches per hour. It corrects errors of previous processing and generates true roundness, bore wall and axial straightness in a majority of applications within tolerances ranging from .0001 to .0005. It is available with automatic size control which holds size uniformity within .0001 to .0003 in high production.

MICROMATIC HONE CORPORATION

DETROIT 4, MICHIGAN

MICRO MATIC

ROCKFORD POWER-GRIP CHUCKS HOLD for A BIG BITE!

"The Deep Magnetic Penetration Does It"

The magnetic circuit in Rockford Power-Grip Chucks penetrates chuck and work, locking them together in a power grip that holds for heavy cuts on milling machine, shaper or planer.

Knotty Holding Jobs Simplified
Costly Time Lags Eliminated

ROCKFORD MAGNETIC PRODUCTS COMPANY
1304-18th Ave., Rockford, Ill.

WRITE FOR THE POWER-GRIP BOOK

Avoid SPOILAGE of Parts!

HERE'S HOW!

Reduce Production Costs!

Faulty tapping and reaming, resulting in oversize or bell-mouthed holes, can often be corrected by merely changing to a type of tool holder that automatically compensates for spindle misalignment. This is where the Ziegler Floating Tool Holder comes in. It always floats freely without friction or cramping, taking any and all end-thrusts.

Try it! By eliminating scrapped parts, it pays for itself in a remarkably short time.

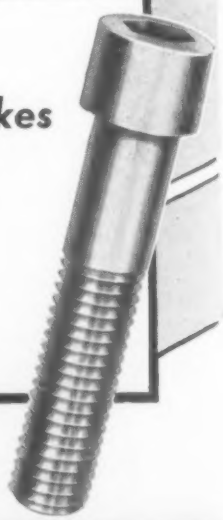
W. M. ZIEGLER TOOL CO.
1930 Twelfth Street Detroit 16, Mich.

WRITE FOR CATALOG

Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

Why are Mac-its used on Extra Tough jobs?

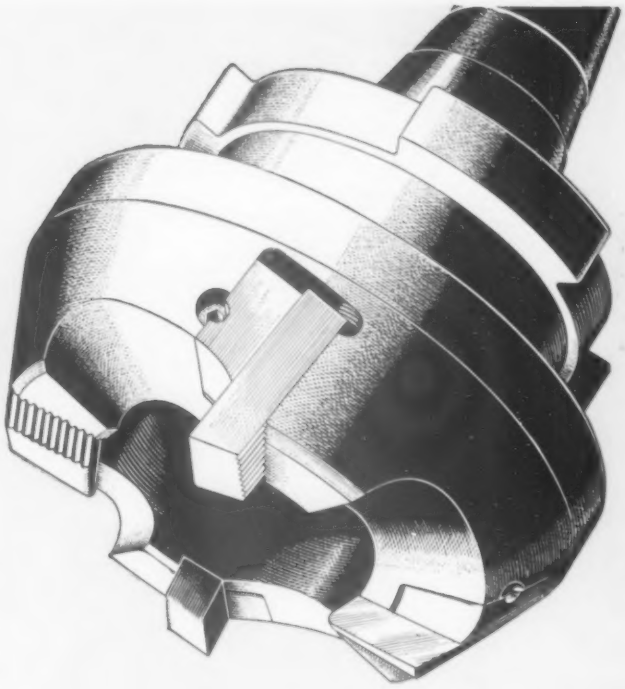
Because . . .
Mac-it Process makes
them STRONGER
more UNIFORM
more ACCURATE



Mac-it Products Include: Socket Head Cap Screws, Hollow Set Screws, Hexagon Head Cap Screws, Square Head Set Screws, Stripper Bolts, Hexagon Socket Pipe Plugs.

STRONG, CARLISLE & HAMMOND CO. • Cleveland 13, O.

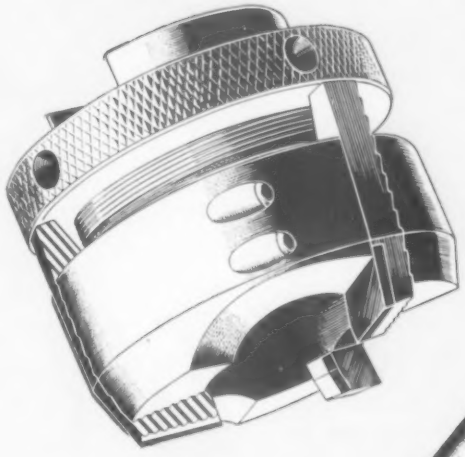
Custom-built Hollow Mills

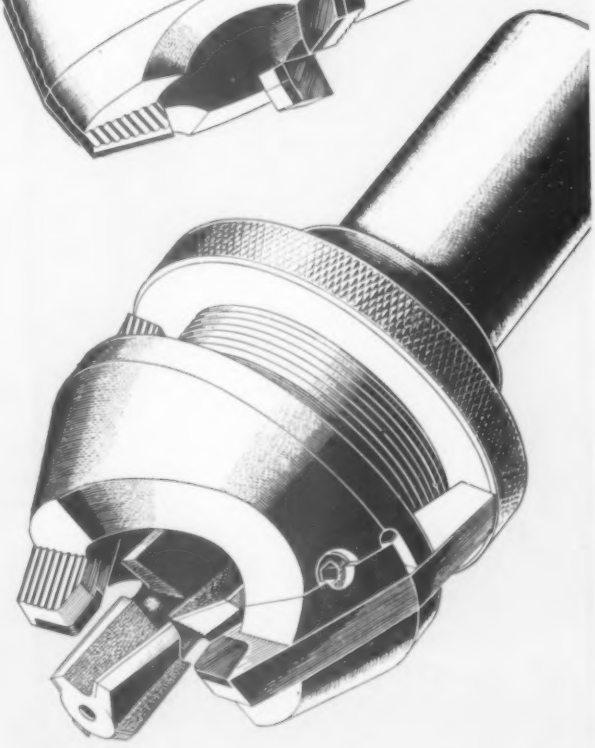


Gairing Hollow Mills are designed and built to secure the greatest machining efficiency, the longest tool life, the lowest machining costs.

Refinements in design permit their use in vertical or horizontal spindles for turning operations, facing, and shoulder cutting on castings or forgings. They give uniform accuracy and quality finish.

Blade adjustment is both radial and lateral. The serrated blades are securely anchored in position by engaging a corresponding serration in the body supported by a steel draw-down lock which holds the cutting blades rigid. The blades are capable of quick adjustment for release or replacement.





THE GAIRING TOOL COMPANY, Detroit 32, Michigan

Designers and manufacturers of Standard, Special and Gair-Lock Inserted Blade Cutting Tools.

GAIRING TOOLS

TAPPING TIPS

From Woody Spencer's Notebook

Take It Easy, Brother, You'll Get There Quicker!

Once in awhile I run into a case where everything seems all right —taps right for the job, lubricants O.K., spindle speed is correct, yet the finished threads just don't check. That's when I begin to look for a little pressure in starting the tap. That's bad. Let the tap do the work. Forcing will vary the pitch or lead from that of the tap. And a lot of times you'll get oversize or bell mouth holes. Just remember the tap will find its own lead if you let it. Then it will thread true.

Woody Spencer's Tapping Tips don't pretend to be any technical solution for all tapping problems. They simply aim to pass along to Woody's friends little, everyday hints that someone has found helpful in making routine tapping jobs run a little easier, maybe a little faster or better.

The technical questions belong to the engineers and require specific solutions. So, if you're having tapping problems, send us complete details of the job (material, diameter, depth, lubricant, etc.) and our engineers will be glad to make specific suggestions. No obligation, of course.

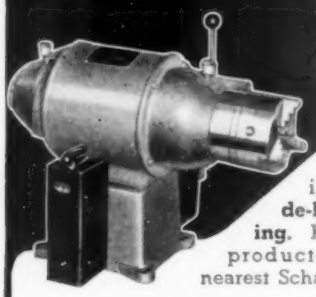
** Note—Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Look for them. Our complete, new catalog just off the press. Send your request on company stationery.*

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company
Cleveland 3, Ohio

IDEAL SPEED LATHES

For accurate, uniform, speedy finishing of metal & plastic parts.



. . a type and size for every secondary finishing operation—**polishing, de-burring, lapping, grinding.** For lower-cost peacetime production, write or call your nearest Schauer representative:

Colcord-Wright Mchy. & Supply Co.
1223 N. Broadway, St. Louis 6

Eichman Machinery Company
235 W. 8th St., Kansas City 6

The E. L. Essley Machinery Co.
Chicago 22 Milwaukee 3
Grand Rapids

Federal Sales & Engineering Co.
Transportation Bldg., Washington 6

Goodspeed-Detroit Company
2832 E. Grand Blvd., Detroit 11

The C. H. Gosiger Mchy. Co.
Dayton 2, Ohio

Harron, Rickard & McCone Co.
Los Angeles 11 San Francisco 10

The E. A. Kinsey Company
311 W. 4th, Cincinnati 2

Marshall-Huschart Mchy. Co.
C of C Bldg., Indianapolis 4

Motch & Merryweather Machy. Co.
Cincinnati 2 Cleveland 13
Pittsburgh 22

The Satterlee Company
118 Washington Ave., N., Minn. 1

W. E. Shipley Machinery Company
1421 Chestnut St., Philadelphia 2

Syracuse Supply Company
Syracuse, Buffalo, Rochester

Triplex Machine Tool Corporation
125 Barclay St., New York 7

W. W. Wentz
121 Powers Hotel, Rochester, N. Y.

Williams & Wilson, Ltd., Canada
Toronto, Montreal, Windsor, Quebec

AWARDED October '42

SCHAUER MACHINE COMPANY

ORIGINATORS OF TODAY'S SPEED LATHES
2066 READING ROAD ..... CINCINNATI 2, OHIO

Darwin

PRK-33
COBALTCROM

Air Hardening, Non-Deforming Cobalt High-Carbon, High Chromium Steel

A tool steel with an original basic formula of our own specifications.

Recognized for long die life and unsurpassed quantity production runs.

Outstanding characteristics are simplicity of treatment, uniform hardness penetration to the center, secondary hardness, extremely high tensile strength, resistance to abrasion.

Ideal for blanking, drawing, forming, trimming and shearing tools.

Furnished in Bar Stock, Billet, Forging, Casting and Welding Rod

Bulletin on Request

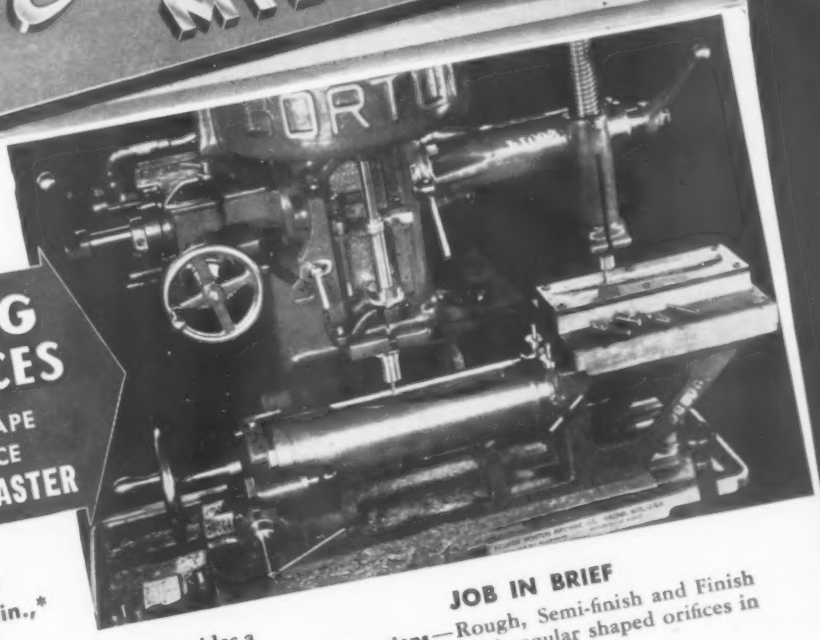
DARWIN & MILNER Inc.

highest grade tool steels

1269 W. FOURTH ST. CLEVELAND 13, OHIO

GORTON

SPECIALISTS FOR OVER 50 YEARS IN Tracer-Controlled MILLING



PROFILING *TWO* ORIFICES

Of IRREGULAR SHAPE
In TUBULAR PIECE
From ONE FLAT MASTER

SIX Operations Completed on ONE Machine in 40 Min.,* Floor to Floor

Gorton Tracer-Control Duplicating provides a simple, fast and accurate means for machining irregular shapes in parts like this Bronze Recoil sleeve shown above. Specifications for this job called for an orifice on opposite sides of the sleeve.

Both orifices required a rough, semi-finish and finish cut—the latter with a 1/4" diameter end mill to produce 1/8" radii at the two corners. Only one set-up is necessary to complete the six operations (3 cuts around each of two orifices) accomplished with a high degree of uniform accuracy, in 40 minutes, floor-to-floor time.*

The simplicity of Tracer-Controlled operation permits even the most difficult work to be accomplished by inexperienced help.

*NOTE—Time greatly reduced in other plants by using a battery of six or more Gorton Duplicators in multiples of three (1 for each cut) eliminating ALL cutter changes.

JOB IN BRIEF

6 Operations—Rough, Semi-finish and Finish Milling of *TWO* irregular shaped orifices in sleeve.

Material—Bronze.

Cutters—(only 3 needed)—Four-flute, fast spiral end mill, 7/16" diameter, two End Mills, 3/8" and 1/4" diameter.

Speed—1900 r.p.m.

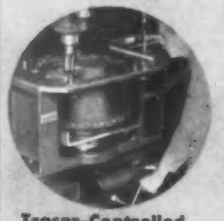
Feed—Manual.

Production—40 minutes per sleeve.

GORTON FREE ENGINEERING SERVICE

You are invited to consult Gorton engineers on any jobs applicable to Gorton equipment. Please submit details of your job to your nearest Gorton Dealer or Factory at Racine, Wisconsin. Recommendations made without charge or obligation.

The *Right* Size
The *Right* Type
of Machine
for Every Job...
From 2 oz. to 2 ton
DIE BLOCKS



Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON Precision MACHINES

CUTTER GRINDERS
ETCHING MACHINES
2 & 3 Dimensional PANTOGRAPHS
Vertical & Universal Head Super-Speed MILLERS
Manual & Electric Control DUPLICATORS

TEAR OFF COUPON AND MAIL TODAY

George Gorton Machine Co.,
2609 Racine St., Racine, Wis.
Send me these free books

- ☐ Condensed Catalog
- ☐ Die and Mold Duplicators

Name..... Title.....

Company.....

Address.....

City..... State.....

We can deliver

Instant Coolant Control with "BULLSEYE" SPOUTS

They're flexible enough for finger tip adjustment as the work progresses, yet stiff enough to stay where set, at any angle or curve.

They form the ideal whip-end of a coolant supply line. Easily conducted over, through or around machine parts. Far superior to rigid piping, as all elbows, tees, ells, connectors, adapters and swivel spouts are eliminated.

EFFICIENT ECONOMICAL

Inexpensive to buy, install and service. They're scaleproof and leakproof—and they last and last.

Available in any length, and I. D. from 1/8" to 3/4".

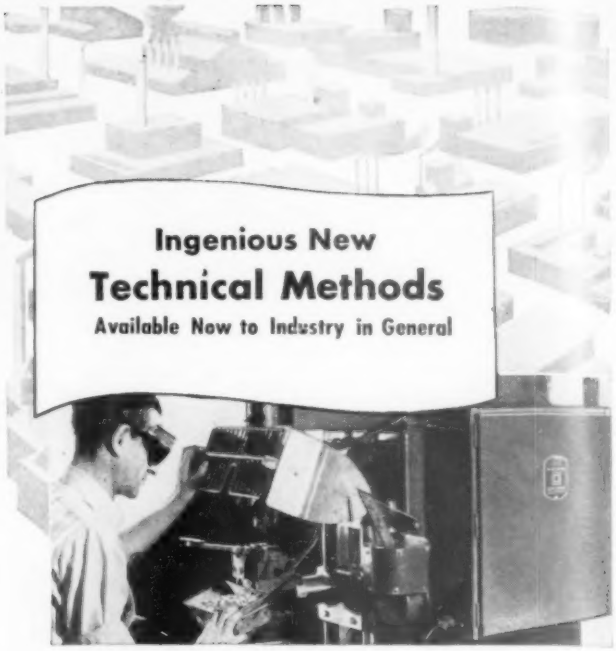
Can also be used for oil, air, plastics or grease.

WRITE FOR CIRCULAR.

•

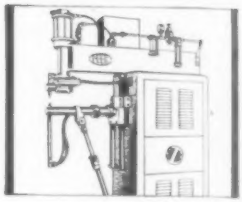
J. N. FAUVER CO.

153 W. Hancock Ave. Detroit 1, Michigan



Now! Projection Welding of Two Studs to Housing in One Operation!

The series of P-20 Peer Welders were developed to provide manufacturers of sheet metal and wire products with automatically air operated machines capable of high speed precision projection and general spot welding. They are sturdily constructed, low priced, direct air operated, press type machines.



Air Operated
Press Type Spot Welder

Shown above, is a Peer P-20 set up with safety guard which is so adjusted that, when lowered, it trips the switch and causes the welder to pass through a complete welding cycle before the machine automatically lifts the guard and stops, ready for the next operation. Other means such as a foot-switch control, can also be used to actuate the welding cycle.

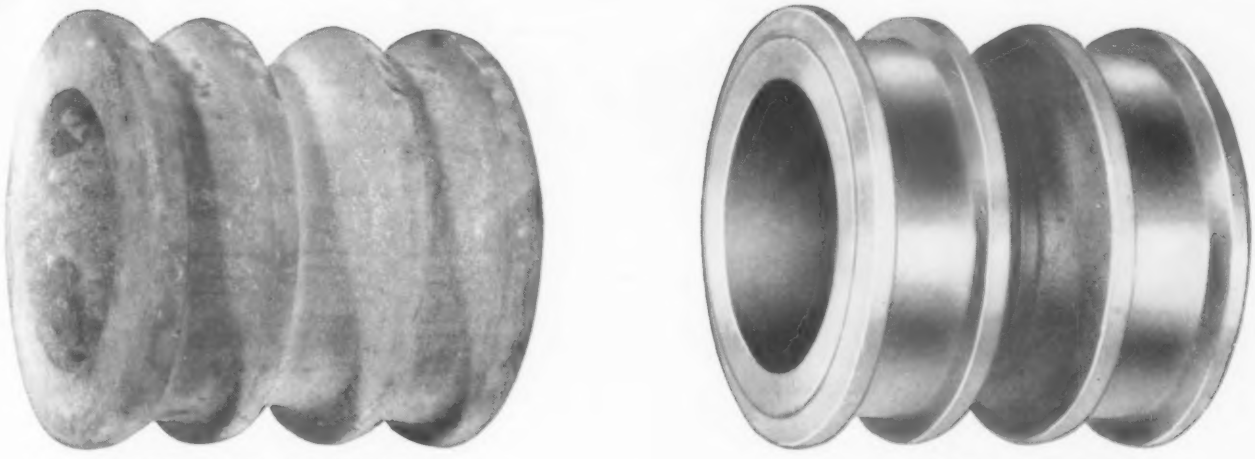
The standard cylinders furnished with these welders provide nominal electrode force up to a maximum of 1000 lbs. Pressures are easily adjusted by the air pressure regulating valve. The welders may be operated with strokes suitable for work at hand within the range of from 0" to 3".

Remember This Wrapper

Shown at right, is the wrapper from a package of Wrigley's Spearmint Gum. This famous wrapper will remain empty until conditions permit Wrigley's Spearmint manufacture in quality and quantity for everyone. Wrigley's Spearmint Gum, will, one day, be back as "a help on the job" to workers in industry. Until then, we ask you to remember this wrapper as a guarantee of finest quality and flavor in chewing gum!

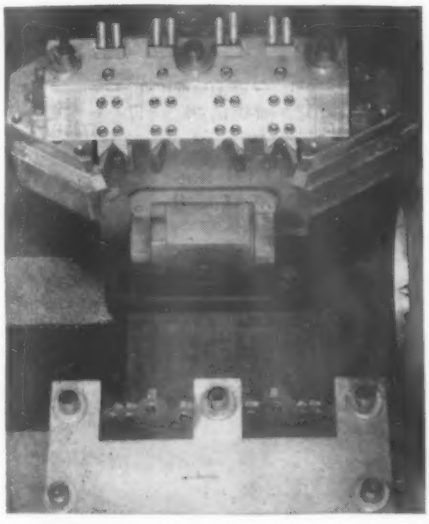
You can get complete information from Pier Equipment Mfg. Co., 8 Milton St., Benton Harbor, Mich.

Z-83



FROM THIS . . . . . TO THIS

IN 4 MINUTES (Floor to Floor Time)

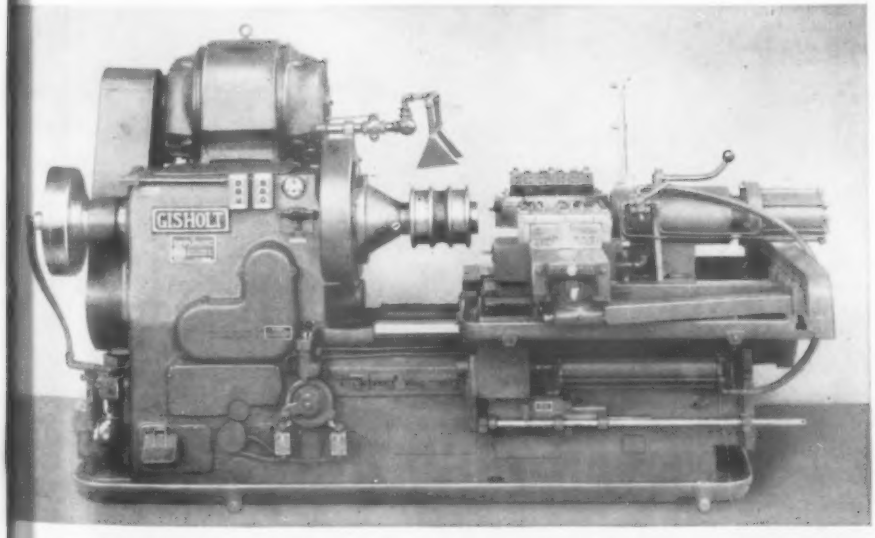


Here's another good example of the way a large number of surfaces can be machined at one time. Gisholt's versatile design permits many variations with two or more heavy duty slides, each with its own drive, its own rate and direction of feed. Yet, all are driven from and accurately timed with the spindle.

These track rollers are machined with 24 carbide tipped tools on 3 slides. Actual cutting time is 2½ minutes using over 40 H.P. Loading, unloading, etc., require 1½ minutes. Total time, floor to floor: 4 minutes.

THE GISHOLT SIMPLIMATIC

The machine shown here is equipped with an expanding arbor operated by a 16″ air cylinder; has a tailstock and three tool slides. It is tooled to machine two sizes of two different types of track rollers. All machine functions are automatic, operated by a single control. An operator can normally tend several Simplimatics. If large volume, low cost machining interests you, write for information about Gisholt Automatic Lathes.



GISHOLT MACHINE COMPANY
1257 East Washington Avenue
MADISON 3, WISCONSIN

Look Ahead... Keep Ahead... With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

AUTOMATIC

- STOCK FEED
- CLAMPING
- WHEEL FEED
- ADJUSTMENT FOR WHEEL WEAR
- EJECTION

...AND HERE'S A TYPICAL JOB

● To finish cut rollers for bearings from 52/100 bar stock to close tolerances. Former method required grinding ends. With this new Model 700 AUTOCUTTER the job is done automatically, one operator running a number of machines. No grinding is necessary.

This line of fully automatic abrasive cutting machines is the solution to many problems of production cutting of short pieces with finished ends and to close tolerances. Model 700 cuts up to ¾" stock—Model 725 up to 2½".

IF YOU HAVE A CUTTING PROBLEM

Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information, CAMPBELL engineers can recommend production procedure and work up cost sheets for you.

Campbell

ABRASIVE CUTTING MACHINES

ACCO

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
AMERICAN CHAIN & CABLE
BRIDGEPORT, CONN.

TRADE MARK

CENTERLESS GRINDER REST BLADES

+ +

RETIPPED AND FINISH GROUND TO YOUR SPECIFICATIONS

+ +

A WORTHWHILE SAVING AND GUARANTEED WORK

National Tool Salvage Company

6511 Epworth Blvd., Detroit 10, Mich.

TOOLS E PRECISION MADE

CONOMY DRILL JIG BUSHINGS and GAGES

will promote greater efficiency and accuracy in your present and post-war production standards.

UNDERSIZE GAGES restored to active service, at a minimum cost, by hard chrome plating and refinishing to original sizes.

Write today for particulars

ECONOMY TOOL & MACHINE CO.

MILWAUKEE 14, WISCONSIN

The Right Tools in the Right Place

You can be sure of *getting top performance consistently duplicated* on jobs calling for mounted wheels and points by supplying each operator with either of Bay State's two handy Utility Sets of Mounted Wheels and Points.

These convenient packages, containing the 12 or 20 wheels and points most commonly used, put the right tool within easy reach . . . no fumbling . . . no delay . . . no lost tools.

Bay State Mounted Wheels and Points . . . the ones in which *abrasive and mandrel are wedded for life* . . . also give you these other advantages:

1. *They need no breaking-in period*—because they are shaped on their own mandrels by precision lathes.
2. *They run absolutely true*—because the shaping process makes them concentric with their mandrels.
3. *They are free from hard and soft spots*—because they are made from blanks pressed to uniform hardness all the way through.

WRITE FOR LITERATURE. For Mounted Wheels and Points that will suit you the first time and ever after, specify Bay State. For extra convenience, order them in Utility Sets. Write for literature describing make-up, advantages and prices of Bay State's two Utility Sets.

BAY STATE ABRASIVE PRODUCTS CO.
9 Union Street, Westboro, Mass.

BAY STATE

ABRASIVE PRODUCTS

Top Performance Consistently Duplicated

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS AND CYLINDERS

Help Increase Production use the

SWEDISH INTERNAL INDICATOR GAGE

It can be set to any required size direct from Johansson Gage blocks or master ring.

This light, easily handled instrument when used by machine operators, or on final inspection, serves to increase production, reduce scrap and assure a more uniform product. It is a reliable, precision indicator designed for rapid, convenient and accurate measurement of internal diameters. The scale range is: Plus or minus 0.001″ graduated to 0.0001″ and minus 0.020″ graduated to 0.001″.

Write for Circular-TE

SWEDISH GAGE CO. OF AMERICA
8900 ALPINE AVE., DETROIT 4, MICH.

BENDER

NO DIES!

SHEAR

"DIE-LESS" DUPLICATING

BRAKE

"DIE-LESS" DUPLICATING

might be described as a new industrial technique made possible by the accuracy, extreme adaptability and ease of operation of DI-ACRO Precision Machines—Shears, Brakes, Benders—especially when used as a continuous, integrated production process.

The DI-ACRO System of METAL DUPLICATING WITHOUT DIES has proven its adaptability in making parts just as accurately as can be done with dies, to a tolerance of .001″ in all duplicated work.
The delay of waiting for dies is avoided, deliveries speeded up.

Write for CATALOG

DI-ACRO PRECISION MACHINES "DIE-LESS DUPLICATING"

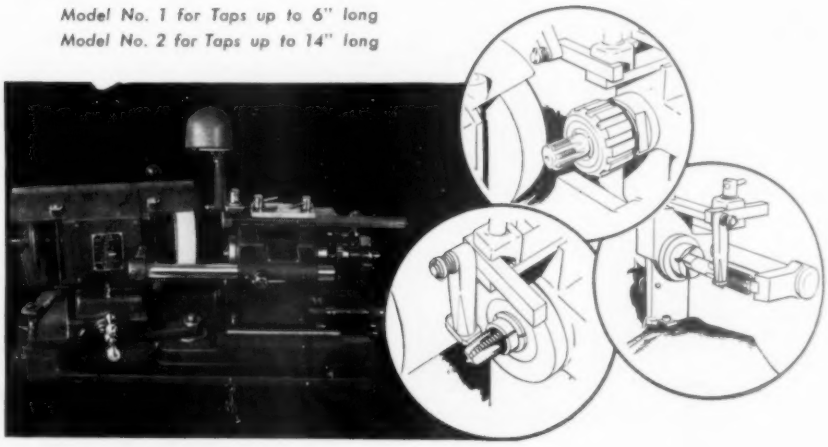
O'NEIL-IRWIN MFG. CO.
311 EIGHTH AVENUE SOUTH • MINNEAPOLIS 15, MINNESOTA

Model No. 1 for Taps up to 6" long
Model No. 2 for Taps up to 14" long

"For Land's Sake"

KEEP TAPS SHARP ON A

BLAKE
TAP GRINDER



When you purchase taps, you expect and get specified tolerances on every part. But, when these taps must be resharpened, do you repeat this *original* accuracy every time? When you sharpen the chamfer on a Blake Tap Grinder, you can be sure of maintaining *original* accuracy throughout the life of every tap. This means an increase in accurately tapped holes, and a decrease in broken taps and scrapped work. For lands sake, sharpen taps (either left- or right-hand) with 2, 3, 4, 5, 6, 8, and 10 flutes on a Blake Tap Grinder. The Blake is also ideal for sharpening countersinks and other tools requiring relief at the point.

No machine is better than the cutting edge of the tool it uses.

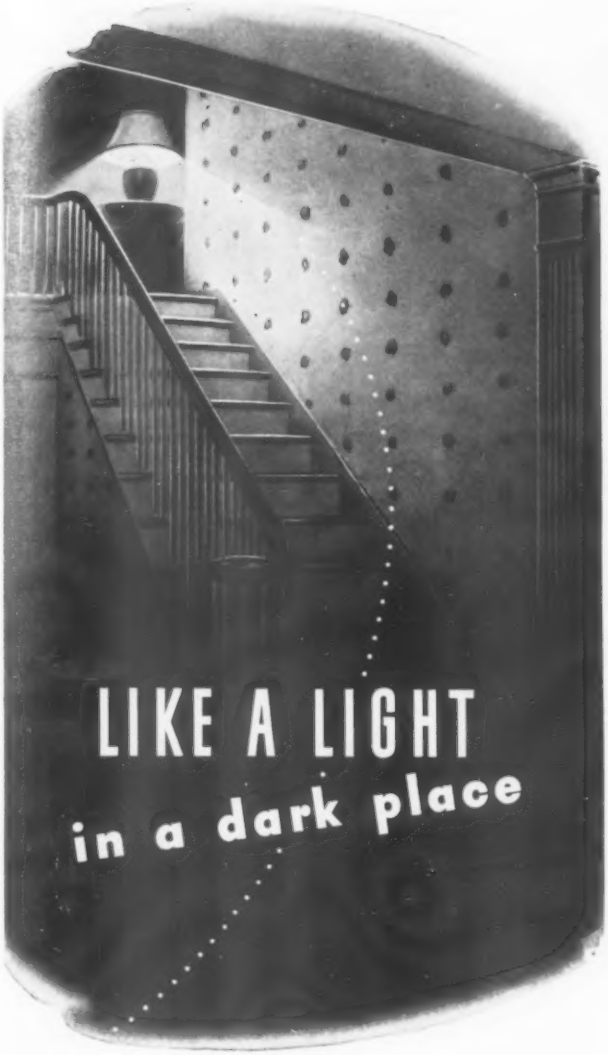
EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

Please send me Bulletin No. 544 which describes the Blake Tap Grinder in detail. T.E.

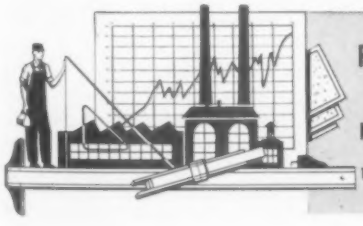
Name..... Title.....
Company.....
Street.....
City..... State.....



● Problems which loom gigantic and fearsome in the darkness of industrial crises shrink to normal dimensions, or disappear completely, when brought into the pool of light generated by Pioneer Engineering's long experience in industrial trouble-shooting.

A closely co-ordinated and sensitively balanced organization, Pioneer engineers and designers, production experts and cost analysts, working in close harmony—and often shoulder to shoulder with the client's own staff—have produced modern manufacturing miracles.

Product design or plant development, or any process or production problem that lies between, can be handled and solved by the Pioneer staff. They have shed light into trouble darkened corners of the industrial scene in almost every state of the union . . . and they can very probably do the same for you.



PIONEER ENGINEERING AND MANUFACTURING COMPANY

1945 JOHN R ST. • DETROIT 3, MICH.

Now! an IMPROVED KENNAMETAL LATHE FILE

- *CUTS STEEL NO ORDINARY FILE CAN TOUCH*
- *PERMITS FILING SPEEDS 3 TO 10 TIMES THOSE POSSIBLE WITH STEEL FILES!*
- *OUTLASTS MILL CUT FILES 50 TO 200 TIMES*

This new Kennametal Lathe File retains all the time-and cost-saving characteristics of previous designs—*cuts steel up to 62 Rockwell C hardness; does outstanding job on cast iron and non-ferrous materials; permits filing operations at carbide tool turning speeds; produces superior finish.*

And now, in addition, it provides these new features—*longer filing surface; quick, easy blade replacement; greater handling convenience.*

The filing surface comprises two 4" long Kennametal blanks which have cylindrical nuts brazed to them, and are attached to the aluminum alloy handle by screws. After long service (up to 200 times that obtained from steel files) the blanks can be readily replaced.

The handle grip has a thumb rest and knuckle guard. An extension of the handle beyond the filing surface provides a secure finger hold. A hole in this extension permits the file to be hung up.

On the first production run, a Kennametal Lathe File usually saves its cost many times over. Order one—let it demonstrate to you an astonishingly low filing cost-per-piece.

Features

REPLACEABLE BLANKS

Kennametal blanks are attached by Phillips head screws. Two types are available, fine (30 teeth per inch); and coarse (20 teeth per inch).

LIGHT WEIGHT

Weighs less than one pound. Can be handled with ease, and used for long periods of time with minimum expenditure of energy

HAND-FITTING GRIP

Handle is comfortable—it fits the hand; provides secure grip. Opposite end of file provides convenient finger hold.

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
KENNAMETAL Inc., LATROBE, PA.

SPECIFICATIONS AND PRICES

COMPLETE FILE		FILE BLANK—2 REQUIRED		
CAT No.	PRICE EACH	CAT No.	TEETH/ INCH	PRICE EACH
F-45*	$18.50	F-453	30	$7.50
		F-452	20	7.50

* Furnished with blanks having 30 teeth/inch unless otherwise specified.

Husky...Dependable

PRECISION FRICTIONLESS

Glenzer LIVE CENTERS

SLIP-IN TYPE
SPINDLE TYPE
SLIP-OVER TYPE
TAPER SHANK TYPE

#1 to #7 MORSE TAPERS

Illustrated is the #7 Morse Taper with 5 inch body diameter. Smaller body sizes from 2 1/16 inch up. Replaceable roller bearings.

LOADS AT 100 R. P. M.:
Radial—1047 to 7275 lbs.
Thrust—197 to 3460 lbs.
All bearing surfaces hardened and ground.

THE J. C. **GLENZER** CO., Inc.
6467 EPWORTH BLVD. DETROIT 10, MICH.

MADE FROM

MEEHANITE METAL

SURFACE PLATES
ANGLE PLATES
UNIVERSAL RIGHT ANGLES
BOX PARALLELS
MASTERANGLE PLATES
STRAIGHT EDGES
TOOLMAKERS' KNEE
LAPPING PLATES
FLAT PARALLELS
TRY SQUARES
ANGLE ATTACHMENTS

These precision production tools incorporate every factor that contributes to accuracy. The Honeycomb pattern surface plate distributes the weight evenly over the entire surface. Meehanite Metal—a specially processed iron recognized for its uniform textures, fine close grain, strength and solidity, through all sections. A special heat treatment is given the iron to relieve casting and machine strains. This PREVENTS distortion and changes taking place after the surface has once been scraped.

Write for Descriptive Circular

ACME TOOL CO. 194 Church Street NEW YORK 13, N. Y.

LOWER COSTS for BETTER PRODUCTS

with Acme-Gridley CHUCKERS

Let's look ahead six months or a year, or two years—to the time when war production is finished.

Nation-wide plant capacity will be greater than ever before. We can make more goods than reasonable demand can absorb.

With material and labor costs about the same in all plants, isn't it logical to look upon *time of production* as the one controllable factor in setting up competitive prices?

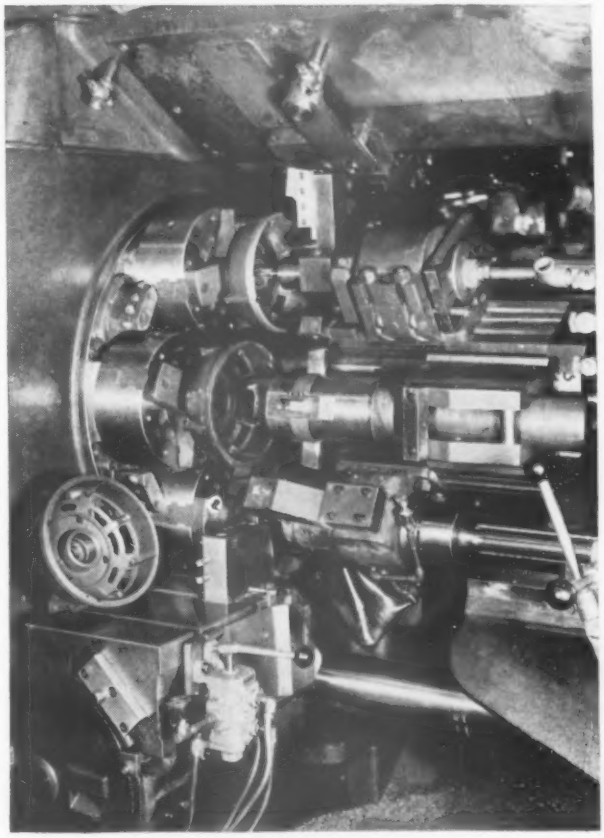
Here is a typical example:

The part is a cast iron motor bracket, 10½" in diameter. There are many ways to do the 14 operations necessary to finish this part.

On a 12" Six-Spindle Acme-Gridley Chucking Automatic, using carbide-tipped tools, machine time for all 14 operations was cut to *less than a minute.*

That's the way Acme-Gridley Chuckers can help you achieve lower competitive selling prices—by producing your precision parts in less time.

Acme-Gridley Chuckers are universal machines—not special one-purpose tools.



Booklet "How Costs Were Cut on 25 Chucking Jobs" shows their broad-range adaptability. Send for your copy.

The NATIONAL ACME CO.

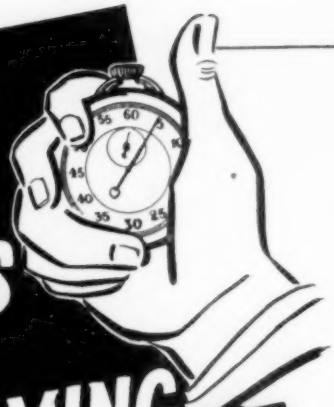
170 EAST 131st STREET •. CLEVELAND 8, OHIO

COLLETS AND PUSHERS

The design, materials and methods of processing GENUINE Acme-Gridley Collets and Pushers are vital to continuous low-cost performance on your Multiple Spindle Automatics.

Bulletin CP-45

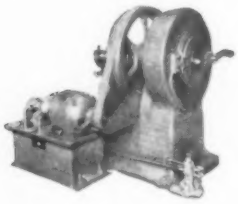
ATTACHED *in* 5 SECONDS *by* HYDRO-FORMING



"Standard"
HYDRO-FORMER

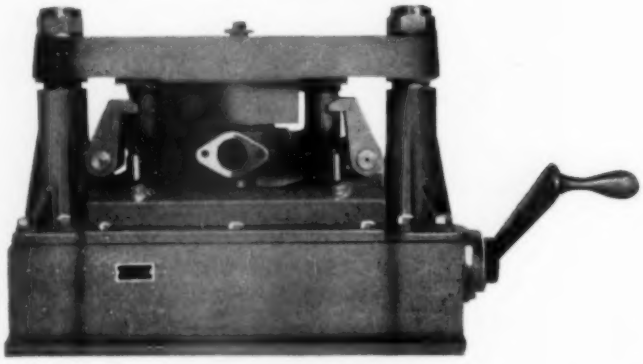
assures easy, positive attachment of fittings to cable, rod, metal tube and flexible tube ... gives smooth, high finish within close tolerances.

Write for Catalog describing the "Standard" HYDRO-FORMER.



STANDARD MACHINERY COMPANY

1585 Elmwood Ave., Providence 7, R.I.
Export Dept.: 1111 South Ferry Bldg., New York 4, N.Y.



PROPOSAL L-878

Heavy duty built up type fixture drilling manifold. All locating, chucking and clamping is done by the movement of operating lever.

DESIGNERS

BUILDERS

ALL TYPES OF SHOP PRODUCTION TOOLS

STANDARD FIXTURES AND FIXTURE LOCKS

SWARTZ TOOL PRODUCTS CO., INC.

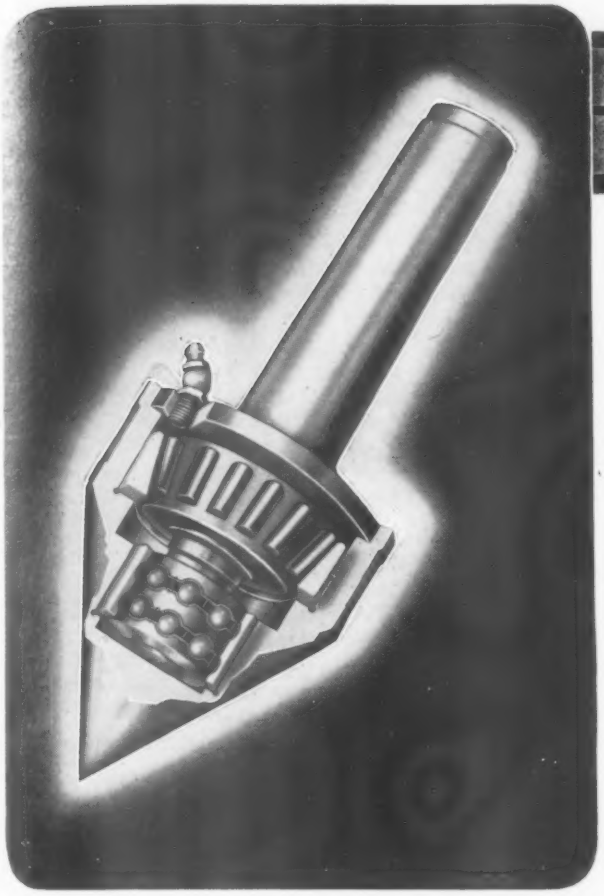
330 Foley — **ASK FOR CATALOG 941** — **Detroit, Michigan**

Represented by

Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Houston—Engineering Sales Co.
Chicago—Ernie Johnson

Canada—Hi-Speed Tools, Ltd., Galt, Ont.
St. Louis—Mill Supply & Mach. Co.
Los Angeles, Calif.—Production Tool Engineering

Oneida, N. Y.—W. F. Himmelsbach
Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool & Equipment Co.



MARVECO

...THE FUTURE...

The future strength and prosperity of American industry depends largely on the efficient use of improved and modern machine tools. MARVECO is the most EFFICIENT and MODERN Live Center made.

The MARVECO is GUARANTEED to OUTPERFORM and OUTLAST any other LIVE CENTER.

Our illustrated catalog will be sent upon request. See for yourselves the MARVELS of MARVECO.

Send us Your

CENTER PROBLEMS

MARVEL TOOL & MACHINE CO.

10981 W. JEFFERSON AVE, RIVER ROUGE 18, MICHIGAN

SPECIAL "NEGATIVE RAKE" MILLERS

FOR MACHINING STEEL AT HIGH SPEEDS

O K Negative Rake and Spiral Milling Cutters take a "shearing" cut from rear of blade to point, leaving a high finish on steel. This often saves the cost of an extra finishing operation.

Such tools must be made of the very best material, with extreme ruggedness embodied in the design. As great strength and rigidity are inbuilt qualities of O K Milling Cutters, they are a natural base for these new cutters.

If you have a place in your postwar program for negative rake milling, it will pay you to investigate the O K line. We shall be glad to make constructive recommendations without obligation wherever such are possible.

GRINDING <OK> CUTTERS

THIS BOOKLET FREE

This useful booklet is a complete treatise on grinding inserted-blade milling cutters, reamers, counterbores, etc. Profusely illustrated, descriptive matter easy to understand. A valuable booklet in any metal working shop. Sent free.

THE O K TOOL CO.,
SHELTON, CONN., U.S.A.

INSERTED-BLADE METAL CUTTING
TRADE OK MARK
TOOL SYSTEM

MANUFACTURED ONLY BY THE O K TOOL COMPANY, SHELTON, CONN., U. S. A.

To Help You CUT COSTS with CUTTING FLUIDS

...Four Booklets

Machining costs come down and machining quality improves when cutting fluids are selected and used scientifically. To help you use cutting fluids to better advantage, D. A. Stuart Oil Co. has available four pocket-size booklets full of information gathered from over 80 years experience.

1. Cutting Fluids for Better Machining. A comprehensive 60-page hand-book on cutting and grinding fluids. Contains much data on general machining as well as oils.

2. Grinding with Oil. Deals with the use of oils for production, precision grinding.

3. The 577th Oil. Contains twenty-two case studies showing results of proper oil application.

4. Water-Mixed Cutting Fluids. A new booklet which explains the "how" and "why" of so-called "soluble oils" and gives many tips on how to handle them.

These booklets are yours for the asking. Indicate by number which you are interested in. *D. A. Stuart Oil Co. Limited. 2729 S. Troy Street, Chicago 23, Illinois.*

D. A. Stuart Oil CO.
LIMITED
ESTABLISHED 1865
Stocks in Principal Metal Working Centers

STREAMLINE THE SURFACES

Superfinish

Six Models Of Machines
(Including Lathe Attachments)

For Superfinishing external, internal, tapered and flat surfaces. Also for Superfinishing milling cutters, reamers and cutting tools.

Write for Complete Catalog

OHIO UNITS, Dayton 4, Ohio
Licensed Manufacturers

IMMEDIATE DELIVERY
USED & REBUILT
MACHINE TOOLS POWER PRESSES

OTT MACHINERY SALES INC.

546 Second Ave. Detroit 26, Mich.
Phone CAdillac 3103

AUTOMATIC SCREW MACHINES
OUR SPECIALTY

POWER FEED For Facing

BORING, TURNING, FACING, UNDERCUTTING COMBINED IN ONE TOOL HEAD

The power feed feature for facing operations insures smooth, uniform movement of tool across work surface. This power feed can be engaged or disengaged instantly. Adjustment of tool for boring is obtained in increments of 1/10,000 in direct reading.

Pat. No. 2,356,651

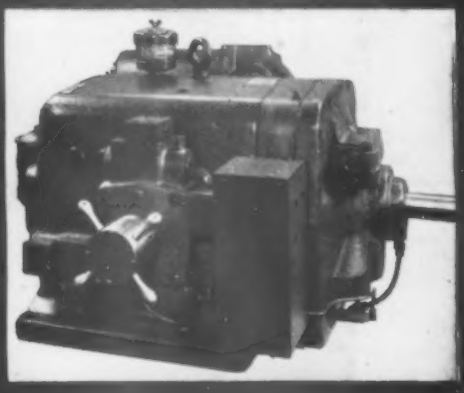
For Jig Borer, Drill Press, Milling Machine

• ALL OPERATIONS IN ONE SET-UP

Cutting bar can be set to any position in Tee slot of slide. Hardened and ground throughout. Feed screw and worm ground from solid. Gears and feed nut phospher bronze. Head 3" dia. x 4" long. Wt. 9 lb. Any type shank furnished. Write for complete information.

CHANDLER TOOL CO.
514 OHIO AVE. MUNCIE, IND.

Oilgear Fluid Power units of this type are the heart of cordite extrusion press performance.



For the SAFE Extrusion of Cordite

ARE YOU TRYING TO

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without preset time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full preset automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

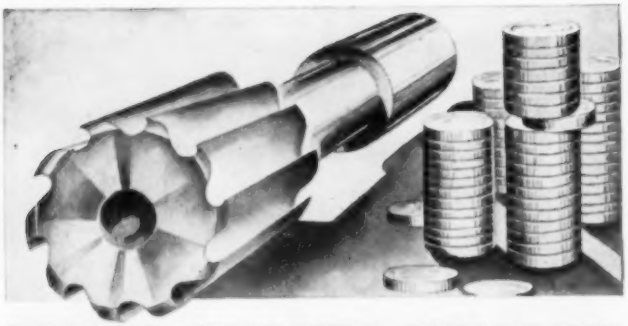
THEY TURNED TO OILGEAR FLUID POWER

Far more powerful than TNT, cordite requires the utmost care in its extrusion. A shade too much pressure, a shade too much speed, a small infraction of cycle sequence . . . and unpleasant things will happen. Curbing this danger and meeting the increased wartime demand for cordite and rocket powders were problems solved by Oilgear engineers. Oilgear Fluid Power is now standard on cordite extrusion presses made by seven large manufacturers. Essential functions attained are rapid advance . . . preset automatic slowdown approach and shockless contact . . . automatic pickup in speed and pressure . . . preset maximum extrusion speed . . . automatic stop to dissipate energy . . . preset and rapid return plus important safety features.

If your rotary or straight line power transmission problems demand exquisite speed and pressure control . . . or require unique functions . . . or present fire hazards and the like, *you need Oilgear*. Write for information now. THE OILGEAR COMPANY, 1308 W. Bruce Street, Milwaukee 4, Wisconsin.

OILGEAR

Fluid Power



TOOLS CREATE WEALTH

Why not decide to get more and better work out of tools, to meet keen competition!

Take advantage of treatments available here which often improve tools 30% to 60% or more. We have specialized in tool treating for a quarter-century. The war has brought new and better methods for original hardening, and also for supplementary treating of tools purchased in a hardened, finished condition.

Now is the time to investigate. Let us show you how other manufacturers have already benefited. More than half the tools now in common use can be treated so they run longer between grinds, hold size better, and produce a smoother finish.

Our "Silver Finish" is bright, clean hardening.

Our "Nusite" means harder, tougher cutting tools.

Our "Ad-Life" improves the tools you buy outside.

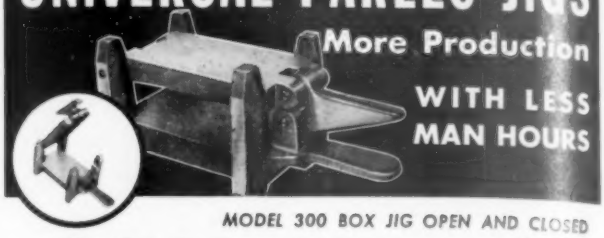
Write for booklet, "FIFTY FACTS." It tells what other manufacturers did to improve tool quality and life.

BETTER HARDENING — BETTER RESULTS

PERFECTION
TOOL & METAL HEAT TREATING CO.
1740-58 WEST HUBBARD STREET CHICAGO 22, ILL.

UNIVERSAL PARLEC JIGS

More Production WITH LESS MAN HOURS



MODEL 300 BOX JIG OPEN AND CLOSED

Box Type Jig in six sizes – Jig Frame and Cover finished top, bottom, and both sides. Base also finished.

To make ready, locate part on base, add side plates if drilling sides, install bushings and clamps. No wasted time and fast operating.

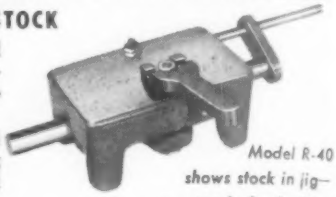
Master Layouts giving exact specifications on request . . .

- ***Saves Tool Designers' Time***
- ***Saves Tool Makers' Time***
- ***Saves Production Time***

STANDARDIZE AND STOCK UNIVERSAL'S DRILL JIGS

ADJUSTABLE ROUND STOCK DRILL JIG . . . Round Stock Jig in three sizes.– Will handle from ¼" to 2" Stock.

To make ready, add bushings, set equalizing clamp by lock nuts, and adjust stop.



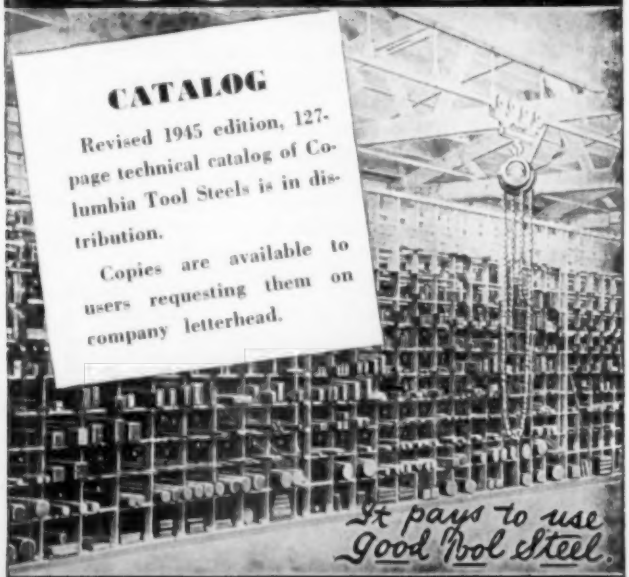
Model R-40 shows stock in jig– ready for bushings

Universal's Jigs are being used by hundreds of manufacturers.

MODELS FROM **$19.25 to $31.75** IMMEDIATE DELIVERY

UNIVERSAL TOOL CO.
919 E. Redondo Blvd., Inglewood, Calif.

Columbia TOOL STEEL


CATALOG
Revised 1945 edition, 127-page technical catalog of Columbia Tool Steels is in distribution.
Copies are available to users requesting them on company letterhead.
It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. CLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
520 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

SIMPLICITY . . . EASE OF CHANGE From Internal to External Makes

PARKER-MAJESTIC

LEADER IN THE GRINDING FIELD

★

For Precision Grinding

Features . . .

- **HAND OR POWER FEED . . . . . .**
- **DEAD AND LIVE CENTER DRIVE . . . .**
- **OSCILLATING TABLE ACTION . . . .**
- **COOLANT FILTERING . . . . . .**

Send for Descriptive Circular

Representatives in All Principal Cities

MAJESTIC TOOL & MFG. CO.
147 JOS. CAMPAU • DETROIT 7, MICHIGAN

Begin with a GOOD Diamond—

Continue with Proper CARE!

The ultimate cost of diamond tools is determined by the *use* —or abuse—they receive. Effective material on diamond tool care is available without obligation from—

KOEBEL DIAMOND TOOL CO.

9454 Grinnell Avenue, Detroit 13

BUY MORE BONDS

Support the

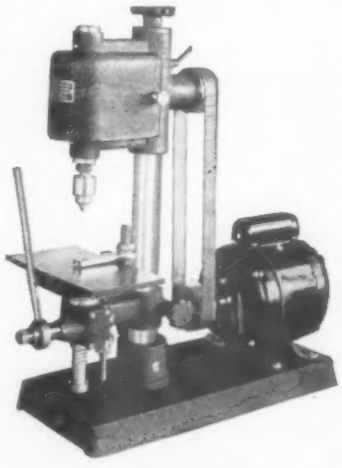
EIGHTH WAR LOAN

Victory Bond Drive

BUY MORE BONDS

More Units Per Hour

HAMILTON SENSITIVE TAPPER



For any threadable material. From smallest and finest threads up to and including 10-32.

FOR tapping operations on instrument, camera, watch, clock, business machines and all other precision work.

Smooth, easy operation without breakage of even the smallest taps.

Fool-proof, noiseless, head mechanism completely hooded so operator is protected from oil and dirt.

Write for Bulletin

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

THE "ROCKWELL" HARDNESS TESTER, WHICH WE ALONE MAKE, IS JUST ONE OF OUR MANY KINDS THAT COMPRISE THE MOST COMPLETE LINE OF INDENTATION HARDNESS TESTERS EVER OFFERED. WITH ONE OR ANOTHER OF OUR INSTRUMENTS YOU MAY TEST MATERIAL UP TO SEVERAL FEET IN THICKNESS OR DOWN TO ONLY HALF A THOUSANDTH THICKNESS OF CHROME PLATE. WE HAVE MADE MORE OF THESE INSTRUMENTS THAN HAS ANYONE ELSE IN THE WORLD AND THEY ARE ALL IN HIGH REPUTE. OUR FIELD MEN ARE EXPERTS AND READY TO ADVISE AND HELP YOU

WILSON
MECHANICAL INSTRUMENT CO. INC.

AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.

How TO DO 2-STEP DRILLING *faster!*

Change Over to Subland Oil-Hole Drills!

You'll be surprised at how much faster you can do 2-step drilling with OIL-HOLE Sublands as compared with ordinary subland drills. This greater speed is made possible because oil is forced through the shank direct to each of the cutting edges, keeping the edges always cool.

Users find that the resulting increased production pays for the cost of the drills in a remarkably short time—and that Oil-hole Sublands also have a much longer life than ordinary sublands. Give them a trial and see for yourself.

Made to Specifications

All sizes from ½" to 3½" in diameter and up to 36" overall. Please specify taper or straight shank. We also specialize in the manufacture of all types of subland drills and reamers.

DETROIT REAMER & TOOL CO.

2830 E. 7 Mile Road, Detroit 12, Mich.

Manufacturers of Oil-Hole Drills, Special Reamers, Circularity Relieved Reamers, End Mills and Special Tools.

Write for QUOTATION

Hammond
OF KALAMAZOO

CARBIDE GRINDERS

A MODEL FOR EVERY NEED!

Hammond's popular, precision-built, wet grinder (shown) has a 10" cup wheel on each end. It features the patented No Spray - No Splash Coolant System, and Safety Cup Discs which prevent tool being dropped into cup of wheel. Write for complete data.

Other Hammond Products: Carbide, General Purpose and Abrasive Belt Grinders • Automatic and Cylindrical Finishers • Polishing Lathes

Hammond Machinery Builders INC

1661 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN
Eastern Branch: 71 West 23rd Street, New York 10, New York

GENUINE CAST BRONZE
TABLETS
HONOR ROLLS
PLAQUES
MEMORIALS
Individually Designed for Industrial Concerns Commercial or Organization
WRITE FOR DETAILS TO DIVISION 7
EMPIRE BRONZE BETHESDA 14, MD. N. Y. OFFICE, 475 5th AVE.

—ANNOUNCEMENT—
A NEW HOME—A NEW DIVISION
ADVANCED TOOL & DESIGN CO.
Now Occupies New Offices
IN 710 LEWIS TOWER BUILDING
LOCUST ST. AT FIFTEENTH ST.
PHILA. 2, PA.—KINgsley 3517
and
A new "Manuals Division" has been added to our list of Engineering Services.

LESS OPERATIONS AND BETTER WORK
WITH A GATCO ROTARY PILOT BUSHING
DUST PROOF

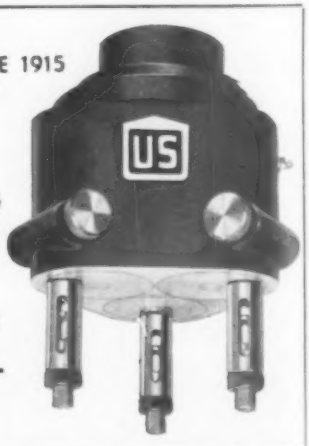
AS A WATCH

ROUND-CHATTERLESS-SMOOTH

GATCO Rotary jig and pilot bushing is built for core drilling, diamond boring, turret tool piloting, piloting hollow mills, line reaming, carbide boring, spot facing, etc.

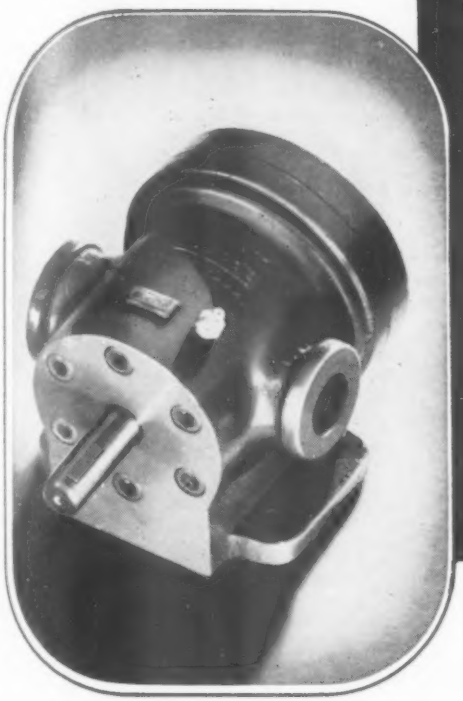
Write for full information and prices
GIERN & ANHOLTT TOOL COMPANY
1308 Mt. Elliott Avenue, Detroit 7, Michigan

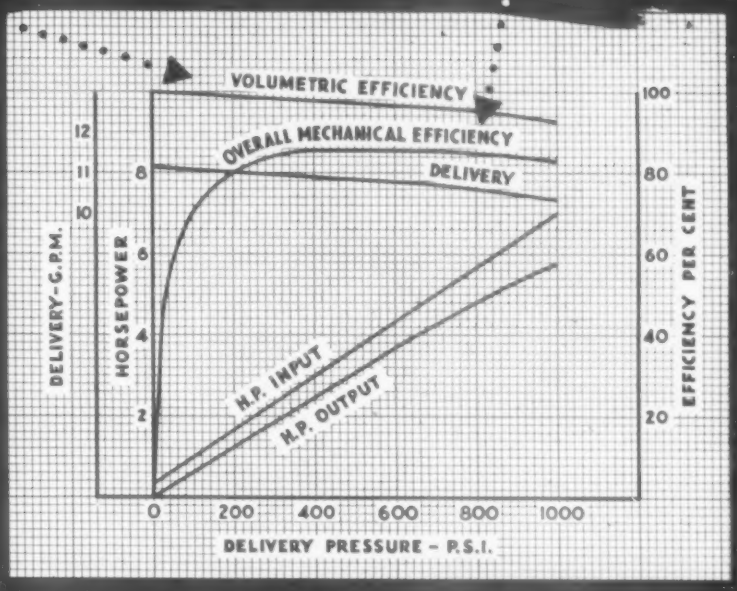
STANDARD US SINCE 1915
HEADS
All Types of Fixed Center
DRILLING, TAPPING & BORING HEADS
FIVE TYPES, 56 SIZES
ADJUSTABLE DRILL HEADS
UNITED STATES DRILL HEAD CO.
CINCINNATI 4, OHIO



HIGHER VOLUMETRIC EFFICIENCY...

HIGHER MECHANICAL EFFICIENCY





Typical curves shown are for V-104-D pump at 1200 rpm; curves for other models are similar. Above curves are for oil having viscosity of 150 S.S.U. at 100° F., temperature of 120° F.

VICKERS

BALANCED Vane Type PUMPS

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function

These performance curves merit careful consideration when selecting constant delivery pumps for oil hydraulic power and control systems. The overall mechanical efficiency is extremely high throughout the important working pressure range. Note that pump delivery and efficiency are not reduced appreciably as pressure is increased. These features, together with the 1000 psi continuous working pressure that is possible, effect an important reduction in pump size and cost. This higher working pressure also means a substantial saving in first cost and in space occupied by cylinders, valves, piping, tank, etc. for a given speed and power.

Other important advantages of Vickers Balanced Vane Type Pumps include: (1) Hydraulic Balance which cancels out bearing loads and means much longer pump life, (2) cartridge assembly contains all pumping parts that move and is important to the simplicity, easy inspection and minimum maintenance of these pumps, (3) compact, yet rugged, (4) automatic wear take-up, (5) temperature adaptability, etc. Ask for Bulletin 40-25a for all the facts about Vickers Balanced Vane Type Pumps.

Vickers Application Engineers will gladly discuss with you how Vickers Pumps and Vickers Hydromotive Controls can be used to advantage.

VICKERS Incorporated

1416 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES
NEWARK • PHILADELPHIA • ROCKFORD • TULSA • WORCESTER

Index of Tool Engineer Advertisers

September, 1945

A

Acme Tool Company 124
Agency—Diener & Dorskind, Inc.
Advanced Tool & Design Co. 132
American Chain & Cable Co.
Andrew C. Campbell Division 120
Agency—Reincke-Ellis-Youngreen & Finn, Inc.
American Tool Engineering Co. 6
B. C. Ames Company 84
Agency—Badger & Browning, Inc.
Anker-Holth Manufacturing Co. 101
Agency—VanAuken & Ragland
Aro Equipment Corporation 104
Agency—Beeson-Faller-Reichert, Inc.
Atlas Press Company 92
Agency—Staake & Schoonmaker Co.

B

Baker Brothers, Inc. 7
Bay State Abrasive Products Co. 121
Agency—James Thomas Chirurg Co.
Bethlehem Steel Co., Inc. 86
Edward Blake Company 122
Agency—Henry A. Loudon Advertising Agency

C

Carborundum Company 78
Agency—Batten, Barton, Durstine & Osborn, Inc.
Chandler Tool Co. 128
Chicago Wheel & Manufacturing Co. 83
Agency—Weston-Barnett, Inc.
Columbia Tool Steel Company 130
Agency—R. J. Skala Co.
Continental Tool Works Division of Ex-Cell-O Corp. 135
Agency—Holden, Clifford, Flint, Inc.
Covel Manufacturing Company 106
Agency—Paxson Advertising

D

Dalzen Tool & Manufacturing Co. 79
Agency—Holden, Clifford, Flint, Inc.
Danley Machine Specialties, Inc. 85
Agency—Behel and Waldie and Briggs
Darwin & Milner, Inc. 116
Agency—Brad-Wright-Smith, Inc.
Defiance Machine Works, Inc. 95
Agency—Beeson-Faller-Reichert, Inc.
Detroit Broach Company 94
Agency—Chas. M. Gray & Associates
Detroit Reamer & Tool Company 131
Agency—Rolfe C. Spinning, Inc.
Detroit Tap & Tool Company 14
Agency—Denham & Company

E

Eastern Cutter Corporation 102
Agency—Acme Art Service
Economy Tool & Machine Company 120
Empire Bronze 132
Agency—Lewis Edwin Ryan

F

J. N. Fauver Company, Inc. 118
Agency—R. Marshall Advertising
Federal Products Corporation 3
Firth-Sterling Steel Company 109
Agency—Ketchum-McLeod & Grove, Inc.

G

Gairing Tool Company 115
Agency—R. Marshall Advertising
Gerotor May Corporation 88
Agency—The S. A. Levyne Company
Giern & Anholtt Tool Company 132
Gisholt Machine Company 119
Agency—The Buchen Company
J. C. Glenzer Company 124
Agency—R. Marshall Advertising
Golconda Diamond Products Corporation 96
Agency—Lieber Advertising Company
George Gorton Machine Company 117
Agency—Cramer-Krasselt Company
Greenfield Tap & Die Corporation 75
Agency—Channing L. Bete Company
Grob Brothers 108

H

The Hamilton Tool Company 131
Agency—Julian J. Behr Company
Hammond Machinery Builders, Inc. 132
Agency—Crescent Advertising Service
Hanchett Manufacturing Company 12
Agency—Paxson Advertising
Hannifin Manufacturing Company 11
Agency—Edwin H. Verrall
Harding Brothers, Inc. 2
Agency—Taylor Ward, Inc.
Hartford Chrome Corporation 112
Agency—The Randall Company
Herman Stone Company 100
Agency—Hugo Wagenseil & Associates
Holo-Krome Screw Corporation 136
Agency—R. H. Young & Associates

I

International Nickel Company 82
Agency—Marschalk & Pratt Company

K

Kennametal, Inc. 123
Agency—W. S. Hill Company, Inc.
Koebel Diamond Tool Company 131
Agency—Holden, Clifford, Flint, Inc.

L

Landis Machine Company 76
Agency—Langsdale Advertising
R. K. LeBlond Machine Tool Company ..... Back Cover

M

Majestic Tool & Manufacturing Co. 130
Marvel Tool & Machine Company 127
Agency—Castle-Powell, Inc.
Micromatic Hone Corporation 113
Agency—Witte & Burden
A. Milne & Company 98
Agency—Horton-Noyes Co.
Monarch Machine Tool Company 90
Agency—Fuller & Smith & Ross, Inc.

N

National Acme Company 125
Agency—Fuller & Smith & Ross, Inc.
National Broach & Machine Co. 77
Agency—Witte & Burden
National Tool Salvage Company 120
Naional Twist Drill & Tool Co. 73
Agency—Holden, Clifford, Flint, Inc.
New England Carbide Tool Company 74
Agency—Henry A. Loudon—Advertising
W. H. Nichols & Sons 80
Agency—Henry A. Loudon—Advertising
The Norton Company 99

O

O. K. Tool Company 127
Agency—Claude Schaffner Advertising Agency
Ohio Units 128
Agency—Ankeney Advertising Agency
The Oilgear Company 129
Agency—Kirkgasser-Drew
O'Neil-Irwin Manufacturing Co. 122
Agency—Foulke Agency
Ott Machinery Sales, Inc. 128

P

Park Chemical Company 89
Agency—Marvin Hahn Advertising
Perfection Tool & Metal Heat Treating Co. 130
Agency—Brandt Advertising Co.
Pioneer Engineering & Manufacturing Co. 123
Agency—St. Claire Advertising Agency
Pipe Machinery Company 93
Agency—Fuller & Smith & Ross, Inc.
Plan-O-Mill Corporation 105
Agency—Holden, Clifford, Flint, Inc.
Pratt & Whitney ..... Inside Front Cover
Agency—Wm. B. Remington, Inc.

R

Rockford Magnetic Products Company 114

S

Schauer Machine Company 115
Agency—Rudolph Krebs Advertising
Sheffield Corporation ..... Inside Back Cover
Agency—Witte & Burden
Standard Gage Company, Inc. 5
Agency—Hevenor Advertising Agency, Inc.
Standard Machinery Company 126
Agency—Hammond-Goff Company
The L. S. Starrett Company 10
Agency—Walter B. Snow and Staff, Inc.
Stokerunit Corporation 110
Strong, Carlisle & Hammond Company 114
Agency—Fuller & Smith & Ross, Inc.
D. A. Stuart Oil Company, Ltd. 128
Agency—Russell T. Gray, Inc.
Super Tool Company 16
Agency—Wolfe-Tickling-Dow & Conkey, Inc.
Swartz Tool Products Co. 126
Swedish Gage Company of America 122
Agency—Rolfe C. Spinning, Inc.

T

Thompson Grinder Company 15
Agency—Kircher, Helton & Collett
Tungsten Electric Corporation 13
Agency—Thoma & Gill

U

U. S. Broach Company 91
Agency—Marvin Hahn Advertising
U. S. Tool Company, Inc. 103
United States Drill Head Company 132
Universal Engineering Company 107
Agency—Seemann & Peters, Inc.
Universal Tool Company 130
Agency—Jordan and LoBuono

V

Vanadium-Alloys Steel Co. 97
Agency—Walker & Downing
The Van Keuren Company 111
Van Norman Company 8
Agency—Sutherland-Abbott Advertising Agency
Vascoloy-Ramet Corporation 9
Agency—Paul Grant, Advertising
Vickers, Incorporated 133
Agency—Witte & Burden

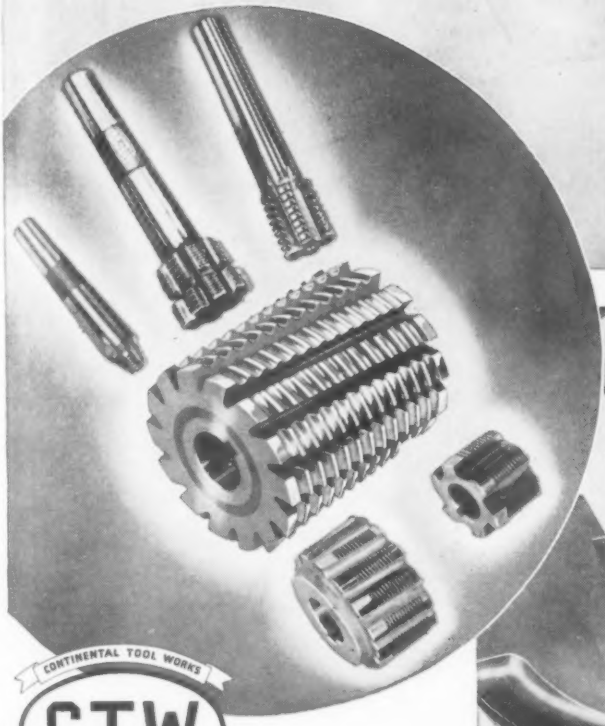
W

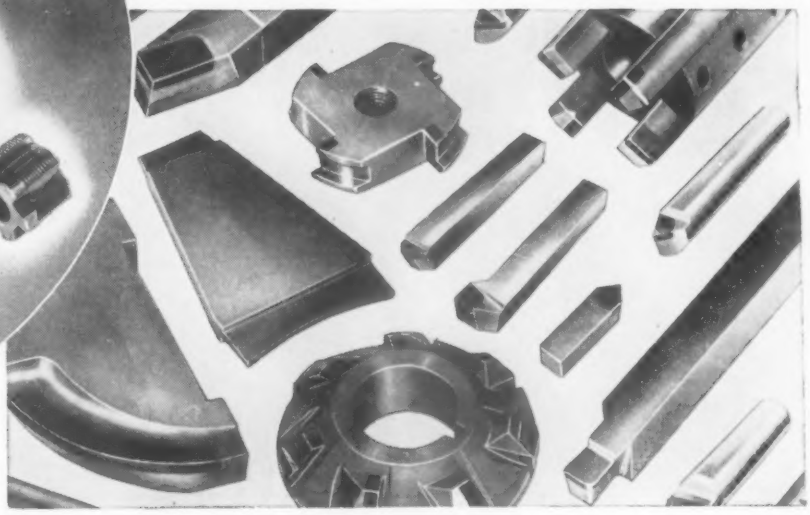
Warren City Manufacturing Co. 81
Agency—Trade Development Corp.
Wilson Mechanical Instrument Co., Inc. 131
Wood & Spencer Company 116
Agency—Scheel Advertising Agency
S. A. Woodworth Company 87
Agency—Brook, Smith, French & Dorrance, Inc.
Wm. Wrigey, Jr. Company 118
Agency—Ruthrauff & Ryan, Inc.

Z

W. M. Zieger Tool Company 114
Agency—Rolfe C. Spinning, Inc.

Check CONTINENTAL for *Precision* CUTTING TOOLS





CONTINENTAL TOOL WORKS
CTW
EX-CELL-O CORPORATION

Since 1919 The Continental Tool Works (a division of Ex-Cell-O Corporation) has been producing special and semi-standard cutting tools to customers' drawings or part prints—until today the Continental name in the cutting tool field is commonly used as another word for "accuracy and quality." This long experience, coupled with the most modern and complete facilities, makes Continental the first choice as a cutting tool source. *Find out now how Continental can help assure you of high production efficiency*—get in touch with your nearest Ex-Cell-O representative or write direct.

CONTINENTAL TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION

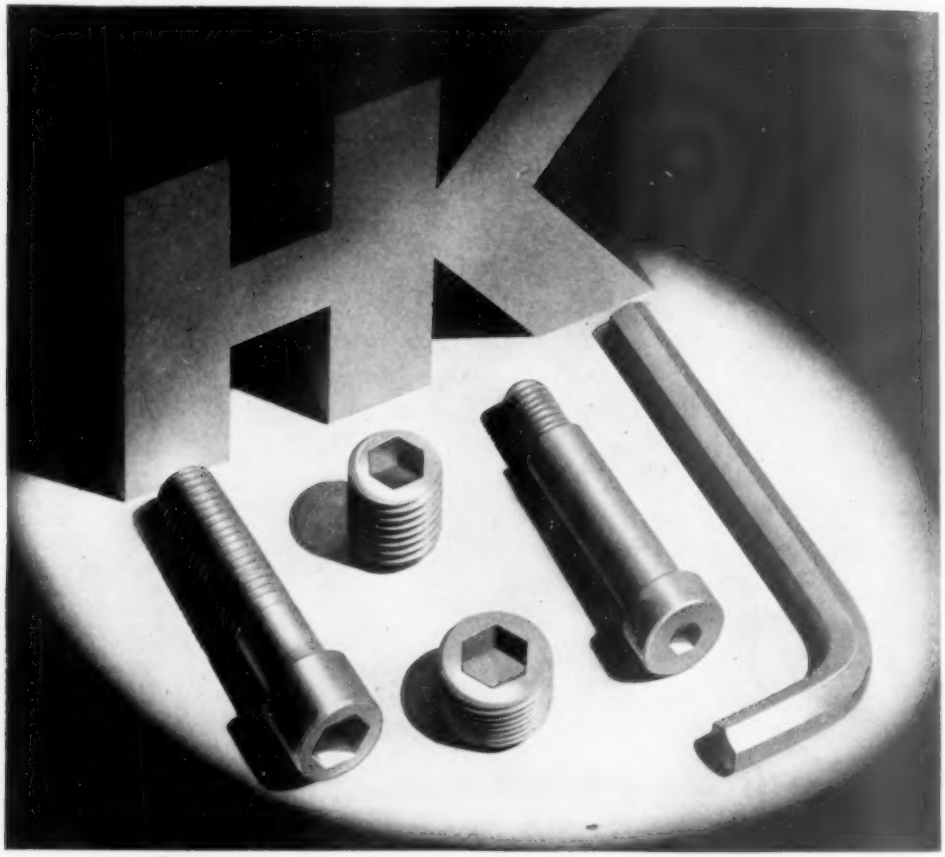
DETROIT 6, MICHIGAN

45-22

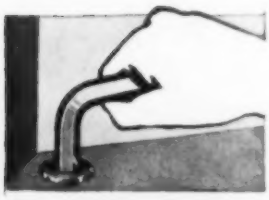
EX-CELL-O *makes* Special Multiple Way-Type Precision Boring Machines • Special Multiple Precision Drilling Machines • Precision Thread Grinding, Boring and Lapping Machines Broaches and Broach Sharpening Machines • Hydraulic Power Units • Grinding Spindles • Drill Jig Bushings • Continental Cutting Tools • Tool Grinders • Fuel Injection Equipment • R. R. Pins and Bushings • Pure-Pak Paper Milk Bottle Machines Aircraft and Miscellaneous Production Parts

UNFAILING PERFORMANCE

Guaranteed by HOLO-KROME



fibro-forged SOCKET SCREWS



. . . INTERNAL WRENCHING

Manufactured by the Holo-Krome exclusive, patented method whereby the head, socket and body—in fact, every portion of the screws (threads excepted) is Completely Cold Forged . . . Superior quality, uniform accuracy and greater strength are the results. . . Yes, Holo-Krome does guarantee every single Screw to give Unfailing Performance!

THE BETTER FASTENING METHOD

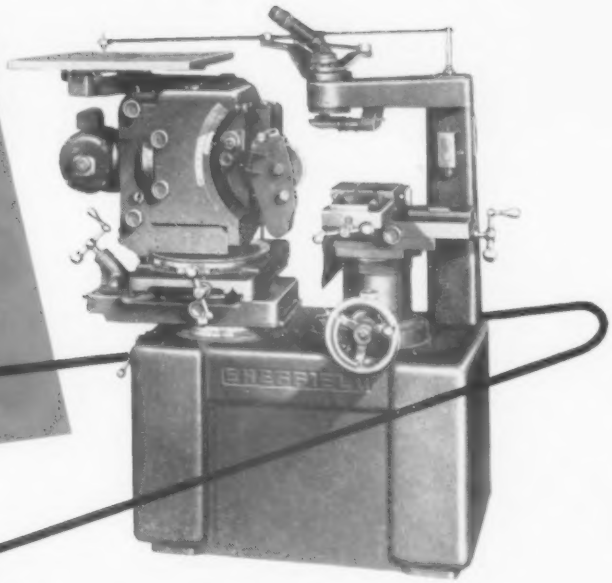
THE **HOLO-KROME** SCREW CORP. — SOCKET SCREW PRODUCTS — HARTFORD 10, CONN. U. S. A.

MAKE PUNCHES AND DIES

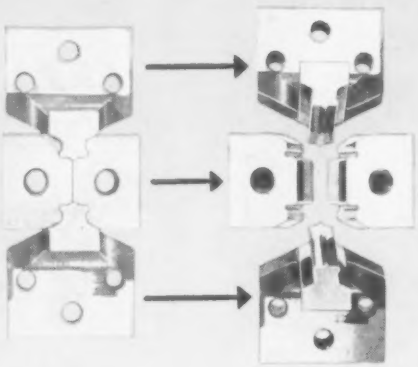
In Half the Time

TO PRECISE LIMITS

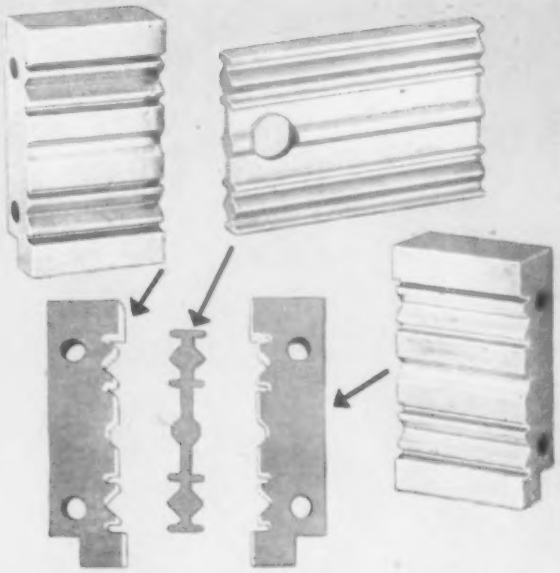
with the



MICRO-FORM GRINDER



If you are grinding punches and dies to close tolerances, you will be interested in the following performance figures. Herewith is illustrated two punches and a pair of matching die halves for producing the notched forms at the ends of a standard razor blade blank. Each punch is ground in 6 hours and the die halves, with closely specified clearance angles, are ground in 6 hours apiece.



Shown here are a die set—a punch and two die halves for slotting razor blade blanks—a difficult, precise grinding job. The punch, about 2 inches long, is ground from a roughed-out heat treated blank in just 16 hours including all alignment and checking. The two matching die halves are ground in 8 hours each (floor-to-floor).

write for booklet M-120-144 telling how to grind profiles direct from the drawing, faster and at lower cost.

THE *SHEFFIELD* CORPORATION

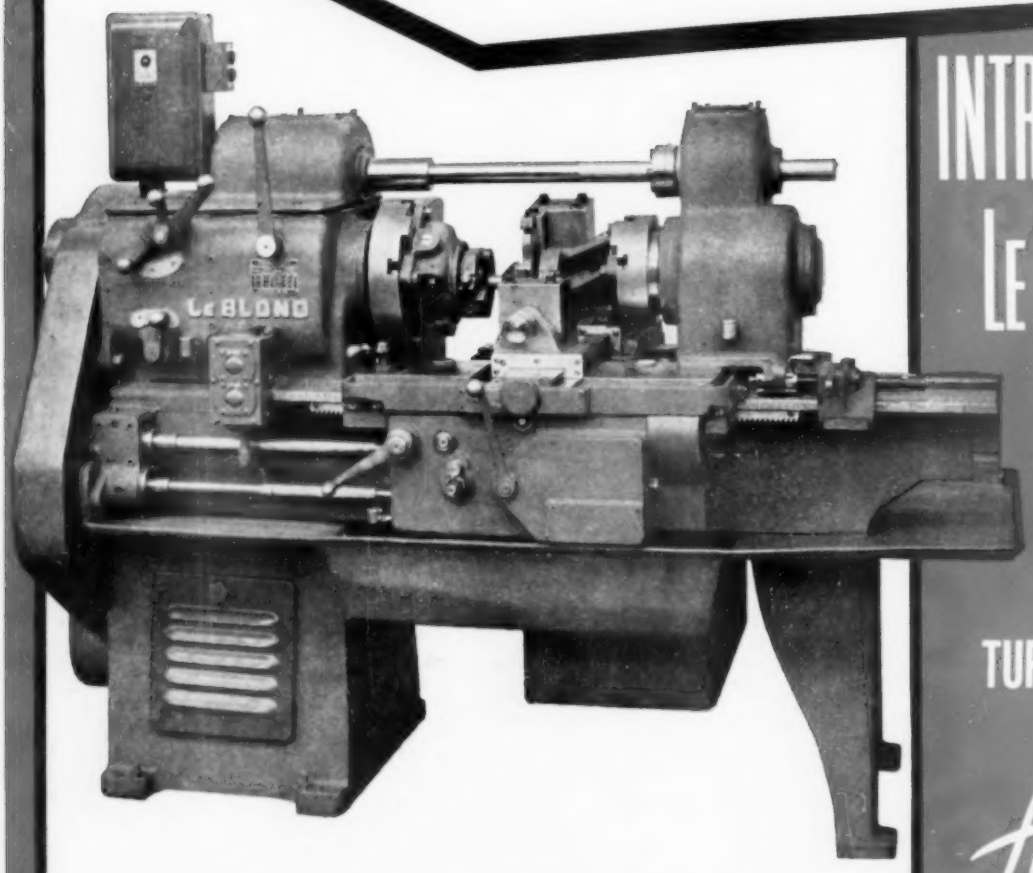
Dayton 1, Ohio, U. S. A.

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

HERE IS THE SOLUTION TO YOUR

SMALL CRANKSHAFT

PRODUCTION PROBLEM



LE BLOND No. 1 CRANK PIN LATHE

- 6-Speed Head
- Universal Index Fixtures
- Complete Automatic Cycle for Each Pin

INTRODUCING LE BLOND'S SMALL DOUBLE END DRIVE CRANK PIN TURNING LATHE

flexible-productive

Send us your prints and production requirements.

ARMY E NAVY

★ YOUR BONDS BUY BOMBS ★
BUY A "BLOCK-BUSTER" TODAY!

THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.

NEW YORK 6, Singer Bldg., 149 Broadway, WOrth 2-0722
CHICAGO 6, 20 North Wacker Drive, STA 5561

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES